

SCIENCE

AN ILLUSTRATED JOURNAL

PUBLISHED WEEKLY

VOLUME XIV

JULY—DECEMBER 1889



NEW YORK

N. D. C. HODGES

1889

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SCIENCE

[Entered at the Post-Office of New York, N.Y., as Second-Class Matter.]

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

SEVENTH YEAR.
VOL. XIV. NO. 335

NEW YORK, JULY 5, 1889.

SINGLE COPIES, TEN CENTS.
\$3.50 PER YEAR, IN ADVANCE.

THE THOMSON-HOUSTON ROAD IN BANGOR, ME.

THE accompanying cuts illustrate the new electric railway which has been put in at Bangor, Me. One of the cuts shows the car on Main Street Hill, opposite the Opera House, a grade of 7 per cent; and the other, the car in West Market Square, the very heart of the city. The road at Bangor is three miles in length, single track, with three turnouts, and contains many sharp curves and grades, the most severe of which is a curve of 35 feet radius, which occurs on a grade of 7 per cent. There is one stretch of the road, about

The power-plant consists of one 80-horse-power Thomson-Houston generator, with the necessary station-fittings, which is driven by a 14 by 13 Armington & Sims engine, running at a speed of 250 revolutions per minute. This is the only tramway which has ever been constructed in Bangor, and it has, from the very start, given the utmost satisfaction, but one schedule trip being missed since the day of starting, May 21. The travel has been very heavy, averaging 1,600 passengers per day, and on one day 3,000 were carried by three cars. The success of the road has been such, that extensions have been asked for in many parts of



THOMSON-HOUSTON ELECTRIC ROAD IN BANGOR, ME.

three-fourths of a mile in length, which has five curves and an average gradient of 5 per cent. No difficulty, however, is experienced here, and the cars climb these grades with a scarcely perceptible diminution of speed. The nature of the overhead work necessitated by these can readily be seen from the accompanying map, on which the situation of the road is indicated by a heavy line.

There are four 16-foot cars, made by the Newburyport Car Manufacturing Company, which are handsomely finished, and equipped with two 15-horse-power Thomson Houston motors. Three cars are in operation from 6 A.M. till 11.30 P.M., the fourth being held in reserve for special occasions.

the city, and it is probable that before long the equipment will be greatly increased.

THE USE OF OIL ABOARD UNITED STATES NAVAL VESSELS.

MANY hundreds of reports have been published on the "Atlantic Pilot Chart," and elsewhere, relative to the great benefits derived by means of the use of oil to prevent heavy seas from breaking on board vessels. By far the greater number of these reports have been received from merchant vessels, very many of which have undoubtedly been saved, with all on board, by the use of a

few gallons of oil in the manner recommended by the United States Hydrographic Office. The following reports from United States naval vessels show that even aboard men-of-war, with their complete equipment and large crews, the use of oil is regarded as of the greatest value:—

Commander W. C. Wise, U.S.N., commanding the "Juniata," on passage from Hong-Kong to Singapore, used oil on three occasions during a typhoon in the China Sea, Sept. 28 and 29, 1888. "Oil was used, and marked effect shown in lessening amount of water coming on board. . . . A bag containing oil was towed from the weather bow, and decreased the violence of the seas to a marked degree."

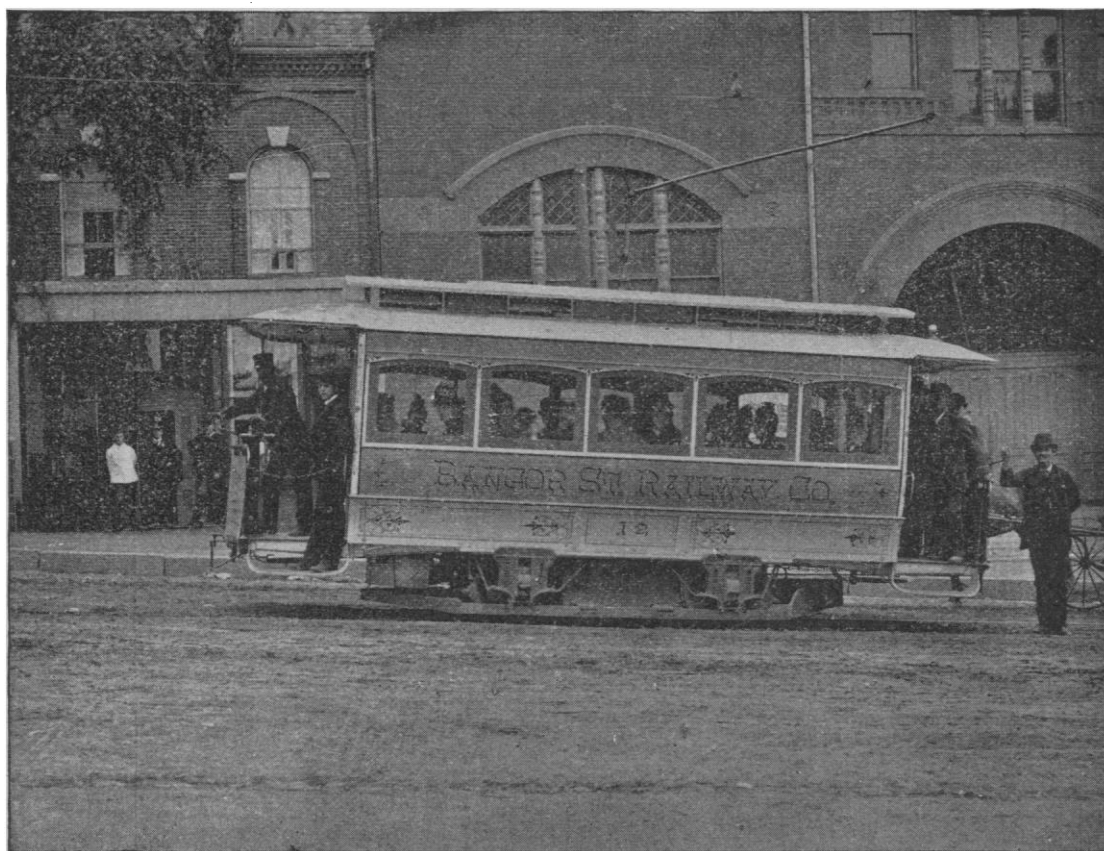
On April 4 and 5, 1889, the "Swatara," Commander John McGowan, U.S.N., was in a hurricane in latitude 41° south, longitude 9° west. On the previous day the wind had veered from west-south-west to north-west, and then to north-north-east. From 9 P.M. to 4 A.M. it blew with a force of 11, and the wind shifted to

from coming on board. Oil was used a part of two days, while hove to.

Finally, the "Yantic," Commander C. H. Rockwell, U.S.N., encountered a terrific hurricane, May 21, in latitude $38^{\circ} 35'$ north, longitude $68^{\circ} 30'$ west. While on her beam ends, with heavy sea sweeping over her, "oil in large quantities was thrown overboard from the weather bow, and even in that terrible scene its effect was immediately apparent."

A HISTORY OF HABITATIONS.

THE French have always exhibited a fondness for the study of comparative architecture, and have made themselves masters of a peculiarly interesting portion of art history in which other peoples have scarcely made more than beginnings. For some years the story of the evolution of the dwelling has been known chiefly through "The Story of a House," by M. Viollet-le-Duc, which has



A 7-PER-CENT GRADE ON THE THOMSON-HOUSTON ROAD IN BANGOR, ME.

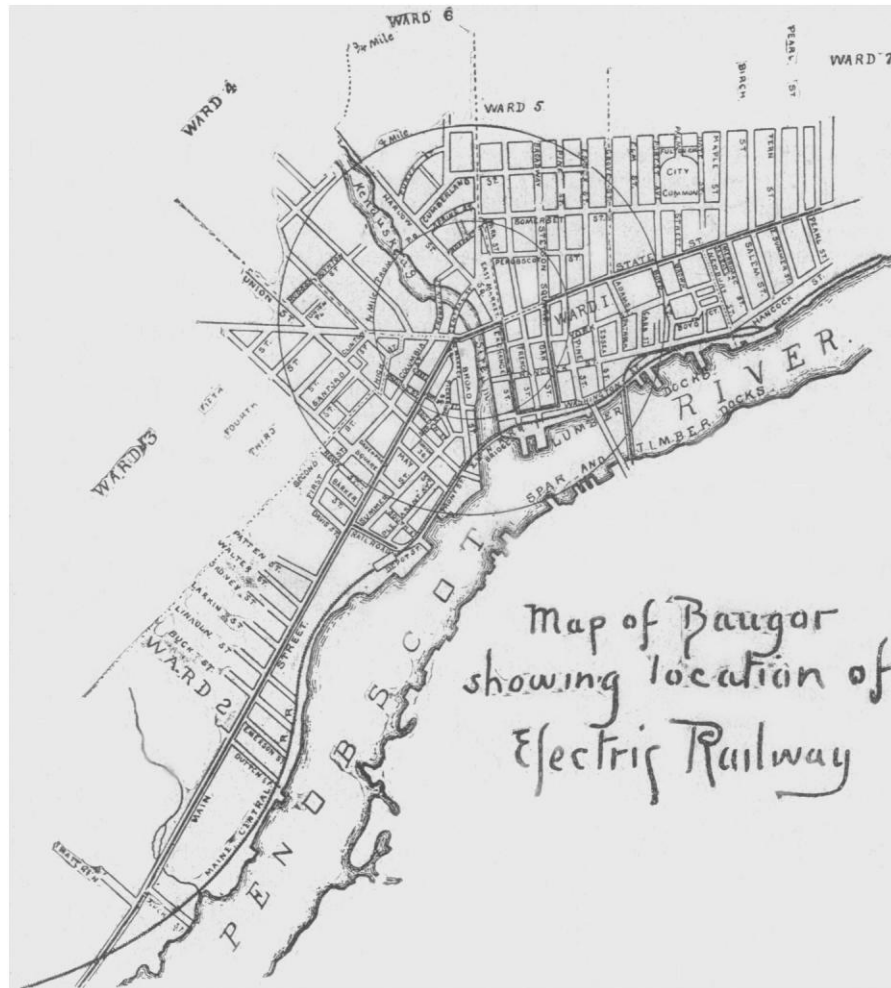
west, kicking up an ugly confused sea. The ship had been hove to on the port tack early in the morning, with oil-bags over at the fore and mizzen chains. Their effect was such that not a drop of water came on board. April 5, scudding with the wind about two points on the starboard quarter and an oil-bag towing at the starboard fore-chains, "the angry-looking crests simply disappeared, leaving one to wonder what had become of them." Again, on the 8th, "Blowing a living gale of wind, force 11, having backed from north-west to north-north-west. Hove to, and put oil-bags over from fore and mizzen chains, with excellent results. The sea was exceedingly heavy, and the ship rolled deeply; and although considerable water came on board, yet not once did a sea break over the rail. The angry, towering crests of the huge waves disappeared as if by magic."

Lieut. C. F. Norton, U.S.N., of the "Kearsarge," reports that in the storm of the 6th, 7th, and 8th of April, off Hatteras, they used oil with good effect, pouring it through the forward water-closet. At first, olive-oil was used, which did fairly well; but later they used lard-oil, and that gave perfect satisfaction, keeping the water

been the most accessible, if not the only, work of its kind extant. In the Paris Exhibition of 1878, one of the most interesting features was the "Street of Nations," which was lined with typical specimens of architecture of all lands, and was unquestionably the most complete exhibition of comparative architecture that had been made up to that time. The present exhibition, however, has, thanks to the rare skill and energy of M. Charles Garnier and a body of enthusiastic assistants, an exhibition of comparative architecture that is by far the most elaborate yet attempted. A series of thirty-two edifices have been erected on the Quai d'Orsay, representing the evolution of the dwelling, from the earliest form of a rude breakwind and cave, to the completed residence of the Renaissance. It is an unfortunate fact that much of the material for such a display exists only in a fragmentary or much-scattered form. The dwellings of antiquity are known to us chiefly by meagre descriptions, rough, sketchy carvings in the sculptures, and other data that are quite as apt to mislead as to indicate the right direction. Yet M. Garnier has not been content to accept mere hearsay, nor even to adopt the results of the imagination, but, on the contrary, has

availed himself of all possible authorities, and as the result has prepared a series of dwellings, which, if not authentic in all their details, are still sufficiently correct to be accepted as the best obtainable, and which are certainly nearer the originals than has been reached by any previous attempts. In designing these edifices, the idea has been to exhibit the actual dwellings of the masses of the people rather than to represent the palaces of the rich and the powerful; and the rule has also been laid down, to represent the most ancient form, where there has been any great deviation in styles, because the more modern variations are more familiar, and have been more frequently reproduced. Both these limitations, admirable in themselves, have added to the difficulty of the task M. Garnier laid out for himself; for the houses of the rich are more frequently described by ancient writers than those of the poor, and

Gauls, Greeks, and Romans. In 395 A.D. the Roman Empire was divided, and the two parts exhibit distinct features of architectural types. In the West the Roman civilization was overthrown by several invasions, all resulting in distinct architectural types. These were the Huns, the Germans and Franks, and, last in point of date, the Scandinavians. After Europe had passed through the convulsions caused by these inroads, we have the civilizations of the Romanesque period, the middle ages, and the Renaissance. In the East other events were shaping the destinies of humanity. The Roman civilization lasted here some ten centuries; but it soon lost its earlier characteristics, and developed into the Byzantine. This was further developed in the Byzantine architecture of the Slavs and the Russians, while the Mohammedan invasions of the Arabs and the Turks soon destroyed its distinctive character. All



the descriptions of the more ancient forms are necessarily less readily interpreted than those near at hand.

M. Garnier has divided habitations into two great classes,—those of prehistoric time, and those of historic. The former period begins with the appearance of man upon the earth, and comes down to the time when nations, properly so called, were formed, and history begins. The historic period includes two subdivisions: the first relating to those peoples who have contributed to the advancement of civilization; and the second including those who, while leaving characteristic monuments, have stood, as it were, on one side, and not influenced the general growth of culture. The models at Paris are arranged in three great groups under these general heads; but, apart from this classification, there is another, which, while not especially observable in the arrangements of the edifices themselves, is of the highest historical importance. The historic period includes, first, early or primitive civilizations, including the Egyptian, Assyrian, Phœnician, Hebrew, Pelagic, and Etruscan; and, second, the civilizations arising from the Aryan invasions, including the Indians, Persians, Germans,

these developments have been admirably summarized by M. Garnier in the "Guide Historique" of M. Ammann, to the exhibition of dwellings.

The structures begin with a simple breakwind. Then man found that the shelter of the caves was more durable, and finally a rude hut was attempted. Then begins the long series of artificial houses. There is a rude hut supposed to be contemporary with the dolmens. A lake-village, modelled after those of Switzerland, is the most elaborate portion of this group, and corresponds to the age of bronze. The age of iron is represented by a hut modelled after a terra-cotta model found at Lake Albino, near Rome. Then come the dwellings of historical times, beginning with an Egyptian house. This is designed in the style the monuments have familiarized us with. A corridor opens into apartments on either side; and the building, which is two stories high, is surmounted by an open balcony. The dwellings of the Assyrians were built on too great a scale to permit them to be reproduced as a whole, so M. Garnier has contented himself with a portion of one only. Two types are represented,—one a tent taken from a bas-relief pre-

served in the British Museum, and the other a part of a palace. It was not possible to secure an authentic representation of a Phœnician house, although the suggestions and opinions of the most competent critics have been followed. The result is therefore not much more than a high probability, but as such it possesses great interest. The dwelling has a stone base, with the upper part of wood, ornamented with long slender columns, and with a balcony above.

Like the Assyrians, the Hebrews have two kinds of dwellings, — one a tent, modelled after a carving in an Egyptian tomb dating from before the time of Moses; and the other a stone house, with a flat terraced roof. Here, also, there is want of authentic material, and the result cannot be regarded as more than approximate. The Pelagic hut is a simple one of large stones, while the Etruscan residence consists of a stone basement taken from an ancient terracotta model, and an upper portion of wood, with an open-roofed balcony, which is confessedly the personal fancy of the architect. The result, however, may be regarded as near the actual truth as our present knowledge permits.

This completes the first series, and we come to those peoples whose civilization has been affected by the Aryan invasions. First is the Hindoo house, — a tall, narrow affair, built after a bas-relief from the top of Sanchi, though the architect has availed himself of the criticisms of Mr. Fergusson. The Persian house comes next. It is in two parts, — one closed, intended for the women; the other, with a dome of enamelled brick, is the public part, and intended for the master himself and his friends. It is designed after information furnished by M. Dieulafoy. Then comes a German village, — rude wooden cabins, with an elevated structure on poles, which serves as a sort of observatory. Close to this is the Gaul house, — a circular hut of wood, stone, and beaten earth. The former is taken from the bas-reliefs of the column of Trajan, while the latter is taken from a host of authorities that render it probably exact. A Greek house of simple construction comes next. A projection at one side serves to accommodate strangers. The walls have, among other inscriptions, the name of the proprietor, "*Heraclès habite ici; que rien de mauvais n'y entre.*" The Roman house, which comes next, is an exact reproduction of a Pompeian villa. The plan and details of this edifice have been prepared with the greatest care.

A new element in civilization is now introduced by the invasions of the barbarians. The first represented are the Huns, who lived in a wagon, and had no regular dwelling. A Gallic-Roman house of the fifth century follows, and is built of fragments of other buildings, which gives it a very peculiar appearance. The Scandinavian house dates from the fourteenth century, and is of wood, with a granite foundation. It has been designed after the suggestions of the Swedish architect Boberg, who has made a special study of early Scandinavian dwellings. Three other buildings bring us almost to our own times. These are, first, a Romanesque house of the time of the successors of Charlemagne (tenth century); second, one of the middle ages (twelfth century), and contemporary with St. Louis; and the third, a specimen of the civil architecture of the Renaissance, a reproduction of a sixteenth-century house at Orleans.

Four other examples complete the list of the civilizations contributing to the general culture of humanity. These are a Syrian (Byzantine) house of the time of Justinian (sixth century), which is an exact copy of one restored and drawn by the Marquis de Vogüé. It is of stone, as wood was scarce in that part of Syria. A Slavic house, almost a primitive affair, comes next, and is close to the Russian house of the fifteenth century. This latter is in two parts, — one for men, and one for women, — with an external staircase. No material for an authentic dwelling of this period was to be had, but the edifice possesses characteristic features. An Arab house of the eleventh century carries us into an entirely different civilization. The building is not a representation of any standing edifice, but is a combination of authentic elements. Lastly comes a Soudanese dwelling, which, though comparatively modern, is, by reason of its very strangeness, one of the most interesting of the entire collection. This brings us to the third section of the series, those illustrating isolated civilizations. There are houses of China and Japan, huts of the Eskimo and Laplanders, a negro village

from Africa, and an Indian hut from North America. The collection is closed by houses from ancient Mexico and Peru.

BARR FERREE.

NOTABLE DERELICTS IN THE NORTH ATLANTIC.

OF the many wrecks afloat in the North Atlantic Ocean, none has as interesting a history as the Italian bark "Vincenzo Perrotta." Abandoned Sept. 18, 1887, this vessel has been represented graphically on every edition of the "Atlantic Pilot Chart" published since that time. Her wonderful drift began in about latitude 36° north, longitude 54° west; and on April 4, 1889, when last reported, she was about 60 miles north of Watling's Island, in the Bahamas. She had thus made good a distance of about 1,400 miles in a general south-west by west direction in one year six months and sixteen days. She has been reported twenty-seven times in all, and when last seen had mizzenmast and about ten feet of mainmast standing, foremast gone, end of jibboom broken off, and port anchor on bow.

On Nov. 26, 1888, the schooner "Ethel M. Davis" was capsized in a hurricane, in latitude 35° 4' north, longitude 70° 52' west. Her wreck was rescued after having been adrift four days. The schooner eventually righted, and began a long voyage, unguided, in the general direction of the Gulf Stream. She was last seen June 8, 1889, in latitude 42° 36' north, longitude 57° 38' west, and at that time had about three feet freeboard in waist, forecastle and poop well above water. Her poop-house is painted white, and shows out well; mainmast gone, bowsprit and ten feet of foremast standing; general drift, about 900 miles north-east by east; time, six months eighteen days; number of times reported, fifteen.

The same hurricane that wrecked the "Ethel M. Davis" also brought disaster to the schooner "David W. Hunt." This vessel was abandoned Nov. 25, 1888, in latitude 34° 30' north, longitude 72° 30' west. She was last reported May 26, 1889, in latitude 45° 30' north, longitude 41° 30' west, at which time she had her bowsprit and jibboom complete, stumps of two masts broken off about fifteen feet from deck; general drift, east-north-east about 2,000 miles; time, six months; number of times reported, twenty-two.

The schooner "Palatka" bids fair to rival the above vessels in point of interest. She was abandoned April 10, 1889, off Hatteras, and was last reported June 4, 1889, in latitude 43° 20' north, longitude 56° 34' west. She was then water-logged and on fire, stern high out of water, no masts standing. Like the "Ethel M. Davis" and "David W. Hunt," she is right in the highway of the great bulk of transatlantic commerce, and a serious menace to navigation. In one month and twenty-five days she has made good a distance of about 1,200 miles, on a general north-east by east course; number of times reported, twenty-one.

The above four derelicts were all timber-laden, and this accounts largely for their great tenacity and buoyancy, at the same time rendering their destruction no easy matter. Commander C. H. Rockwell, U.S.N., of the United States steamship "Yantic," recently engaged in blowing up wrecks, says, "From the experience thus far gained in the work, I am convinced that lumber-laden derelicts are very tenacious, and can only be overcome by repeated blows from explosives of great power. These continued will undoubtedly do the work."

PROGRESS OF ENGINEERING.¹

THE provision of the By-Laws of this society which requires that its president shall deliver, at the annual convention, an address upon the progress of engineering during the preceding year, has been observed by my predecessors in various ways. While some of the former presidents have confined themselves strictly to the constitutional provision, by general reviews of the professional progress and scientific advancement of the period, others have dwelt more in detail upon some specific subjects of particular interest at the time. I trust I may be permitted, in this instance, to give you first a cursory glance of the field at large, and then confine myself more particularly to a review of the progress in that

¹ Address of Max J. Becker, president of the American Society of Civil Engineers, delivered at the annual convention of the society at Seabright, N.J., June 20.

special part of the profession with which the long-continued performance of my official duties has afforded me opportunities to become more familiar.

Electrical Engineering.—Of all the forces of nature, the one which has remained a hidden mystery longer than all the rest, but which of late has distanced all in the rapidity of its development, and which is certainly destined to excel them all in the extended range of its useful application, — electricity, — stands pre-eminent.

In the prosecution of subterranean or subaqueous operations, such as tunnelling, mining, sinking of caissons, the use of electric light is found to be of special benefit. In its incandescent form it is absolutely safe against the dangers from explosive gases, and in caisson work it removes the risks and inconveniences incident to the ready and rapid combustion of inflammable substances under the influence of high atmospheric pressure.

Street-Railways and Rapid Transit.—The rapid growth of our cities gradually forces the inhabitants to seek their homes in the suburbs and surrounding country, more or less distant from the business and manufacturing centres where their employment lies. The desire for economy of time, and the necessity for punctuality and prompt attendance, have led to the introduction of various modes of conveyance, beginning with the street-car tramways propelled by horses, followed more recently by elevated railroads and cable-car lines, and still more lately by the electric railroad; which latter system has, within a few years, developed much more rapidly than any of the preceding methods.

At the close of the past year there were completed and in course of construction, in this country, eighty-five electric railways, comprising about 450 miles of track, and the reports show that during the last year over eighteen millions of passengers have been carried over these lines.

The cheapness of original construction and subsequent maintenance and operation commends their adoption in smaller cities, where the older systems would be out of the question; and the practicability of their application in situations which would exclude cable-lines and horse-traction has led to their introduction in places like my own home, Allegheny City, where an electric railway is now in successful operation, which, in a distance of one mile out of a total length of four miles, ascends, with a speed of fully four miles per hour, a hill over 400 feet high, upon gradients of 12½ per cent, with numerous curves of 40 feet radius, the cars being often loaded with 75 people. Upon the lower portion of this line the electric current is supplied by means of an underground current, and on the upper portion of the line by the ordinary overhead conductors.

But while undoubtedly the electric railway will be generally preferred in the immediate future, it is by no means to be inferred that the cable-lines are to be considered as the motors of the past. On the contrary, their use will not only be continued, but greatly extended, wherever the conditions and circumstances favor their adoption. Among the advantages which they possess, are uniformity of motion, generally satisfactory speed, and the ease with which, in times of heavy travel, the vehicles can be multiplied and combined into convoys; and the facilities which they afford to converging horse-car lines, whose carriages they can attach to their own at the points of junction, saving thereby transfer of the passengers. The machinery used at the power-houses of some of the principal cable-lines is of very superior character, and some of the details employed are models of skill and ingenuity. Noteworthy among these are the engines of the Brooklyn Bridge cable-line, which many of us admired during the excursion at the time of the last annual meeting, and which are very interestingly described in a recent contribution to our "Transactions" by Mr. Gabriel Leverich, one of our members, and at one time secretary of this society.

Elevated railways propelled by steam must necessarily remain confined to larger cities, where the volume of traffic promises a return for the capital invested in their expensive construction, and where the distances to be reached are sufficiently great to make the saving of time, by means of their superior speed, an inducement for patronage.

Water-Works.—The introduction of water-works is now so extensive in this country that there are but very few cities or towns of more than five thousand inhabitants which are not supplied with

one system or another. The beneficial results upon the health of the populations are universally recognized, and the sanitary blessings and the advantages in point of comfort are beyond all calculation. Wherever additions and changes become necessary in the older cities, wise precautions are generally taken, under the advice and direction of professionally skilled experts, to profit by former lessons, and to avoid the errors of the past.

The most extensive enterprises now in progress in connection with water-works extensions are the improvements embracing the new lake tunnels at Chicago and Cleveland, the new Croton Aqueduct in the city of New York, and the aqueduct extension in Washington, D.C. In all these cases the question of greater purity has been carefully considered in connection with the increased supply.

The collection and storing of water-supplies for large cities and manufacturing purposes require, in many cases, the construction of extensive reservoirs, with massive dams for the retaining of the reserve supply. The importance of constructing these dams of proper shape and size, and of suitable material and good workmanship, so as to insure their absolute strength, and give them sufficient resisting capacity against every possible contingency, has been taught by a recent lesson of frightful experience; and while the responsibility for this calamity may not be placed upon the shoulders of the profession, yet it will be well for its members to look upon it and remember it as a warning and an example.

An investigation of the cause of the failure of the South Fork dam is now being made by a committee appointed under a recent resolution of this society, who have just returned from a visit to the scene of the disaster.

Examinations and measurements of the structure and its surroundings, and extensive information obtained from various sources, will enable the committee to submit to the society in due time a comprehensive statement of the conditions and circumstances which have induced and contributed to this most disastrous failure.

Sanitary Engineering.—The extensions and improvements of the water-supplies of our cities naturally lead to the adoption of measures for the disposal of sewage. The respective merits of the different methods employed for this purpose have been very ably presented to the profession from time to time, in occasional contributions to our "Transactions," by several members of this society, who stand pre-eminent in their special calling; so that all that would now seem necessary in an emergency is the exercise of sound and impartial judgment in the adoption of the proper method for each special case.

The system most generally used in this country now, and which will no doubt be preferred for a long time to come, is that of common water-carriage by means of the so-called "combined" plan of discharging all sewage and storm-water together through common outlets into adjacent rivers, lakes, or tidal waters. The objectionable features of this method consist in the pollution of the streams and lakes, from which, in turn, the water-supply may have to be drawn; and the injurious effects caused by the deposit and periodical exposure of offensive matter upon the shores of tidal waters.

In order to overcome, at least partially, these objectionable features, modifications of this method have been tried, consisting in a filtration and chemical purification of the sewage so as to reduce the offensive portions, and to render their final deposit into the streams of the district comparatively harmless. The methods employed for some time at Pullman, Ill., and more recently at Orange, N.J., are samples of this system.

Under the provisions of a law passed by the Legislature of Massachusetts in 1886, the State Board of Health is authorized to investigate, through a commission of experts, the effect of sewage discharge upon the streams and inland waters of the Commonwealth, and to recommend to the courts annually plans in remedy of existing evils. Acting upon the reports of this board, several cities are now making preparations for the disposal of their sewage by various methods of purification and dilution. In connection with some of these systems, the fluid portion of the sewage is utilized as a fertilizer of farm-land.

By the general introduction of natural gas as a domestic fuel in Pittsburgh and other Western cities, a large amount of kitchen-

garbage and house-sweepings, which heretofore were regularly burned with the solid fuel then in use, can no longer be disposed of in that way; and after various unsuccessful attempts to bury them, deposit them in the rivers, and burn them in open air, a number of specially designed furnaces were built for the destruction of these accumulations, to which are now added the offal from slaughter-houses, the leached-out bark from tanneries, and all garbage from the public markets. The heat created by the combustion of these waste substances is successfully utilized for generating steam in boilers attached to the furnaces, which, without the addition of any other fuel, except what is required for ignition, supply the motive power for operating the machinery in adjoining factories; so that these establishments not only improve the sanitary condition of the community by the prompt and radical destruction of vegetable and animal refuse, otherwise liable to decay on our hands, but also furnish a cheap fuel-supply for industrial purposes.

Streets and Highways.—Nearly all the larger cities of this country have now passed the experimental stages of their street-paving experiences, and have by this time entered upon a period of more permanent and substantial improvements in that department of municipal engineering. The days of wooden roadways, the Nicholson, the cedar, and locust blocks, will soon be remembered only as things of the past, like plank roads of earlier date. The various compounds with which, at one time or another, nearly all our city streets have been plastered over and poulticed, have cracked and split, shrunk, melted, and evaporated, and been carried off piecemeal, in course of time, by the persistent adhesion of their ill-flavored mixtures to the boot-heels of the weary pedestrians in hot weather. The abominable cobble-stones, which have jarred our nerves and dislocated our spinal columns in years gone by, are finally relegated to the by-streets and back alleys. Such make-shifts may answer the purpose for a while in new towns of rapid growth, where better materials are not readily attainable, and where first cost is a paramount consideration; but they should never be renewed to the extent that has been the case so often, in spite of the most convincing experience, and contrary to the best counsel of professional advisers. The sums of money wasted in repeating these mistakes would in many instances have gone far towards carrying out much more permanent and substantial improvements.

For streets in the vicinity of freight-stations, or of manufacturing establishments employing heavy teaming, and for streets with steep gradients, pavements should be made of stone blocks of basalt, trap-rock, granite, or hard limestone, laid upon a bed of broken stone ballast, topped off with sand or fine gravel, well rammed, and joints filled with cement grouting or coal-tar; for streets used by lighter traffic or carriages only, a well-laid pavement of pure asphalt upon a bed of stone ballast answers the purpose very well, if prompt attention is given to the maintenance and necessary repairs; for parks and suburban pleasure-drives, a good macadamized road, well drained, and constantly kept in condition, affords a very superior and comfortable highway.

Of late years, pavements of hard burnt fire-clay brick have been extensively laid in many cities and towns of the Middle States, where the supply of this material is very abundant and remarkably cheap. In some towns of West Virginia and eastern Ohio such pavements have been laid for less than a dollar per square yard. They make smooth roadways, are easily kept clean, and last very well under moderately heavy traffic. This pavement is especially well adapted for cities of medium size, which cannot well afford more expensive kinds, and yet require something more substantial and durable than either asphalt or macadam.

But if there is one thing which needs reformation more than any other, it is the condition of our common country roads. If it is true that the highways of a people are a measure of their civilization, then we cannot complain if we are classed as an inferior type of low barbarians. The good nature with which we submit to the imposition of the annual road-tax is only equalled by the sublime resignation with which we accept the result of the effort which swallowed up our money. Our Western members all know what is meant by "working the roads." It means to plough a furrow on each side, and scrape the mud into a ridge in the middle, simply

to be washed down again into the ditches by the first shower of rain. And this performance is repeated year after year, under the provisions of our statutes, and by the consent of a law-abiding but much-suffering people. During the spring and fall, we struggle through the mud manfully as best we can; and when winter comes, and the bottom literally drops out of the roads, we quietly compose ourselves, and contentedly stay at home.

Some years ago, while out on an exploring expedition for a railroad in southern Ohio, I was compelled to hibernate, so to speak, with my entire party, for nearly a month, in a lonely village among the hills of Wills Creek in Noble County; and, when I made an effort to advise my employers of our situation, I was cheered by the comforting assurance of the postmaster that my letter would certainly go out just as soon as the roads dried up.

A faint ray of hope, however, is just beginning to dawn in some parts of the country, most conspicuously in Ohio, where, under the provisions of a recent law, a number of free turnpikes are being built, of quite a superior character, by special tax levied upon the adjacent property.

The beneficial results of this wise system of improvements are very great, and highly appreciated by the people, and it is sincerely to be hoped that other States will profit by the example.

Canals and Hydraulic Engineering.—The days of ordinary canal navigation in the interior parts of this country may well be considered as numbered with the past. With the exception of the Erie Canal, which still maintains to some extent its character as a waterway of commerce, and excepting some parts of the canals in eastern Pennsylvania, New Jersey, Maryland, Ohio, and Illinois, these primitive transportation lines have either been abandoned entirely, after outliving their short period of usefulness, or they are now merely utilized for carrying bulky products between local points, or for the supply of hydraulic power to manufacturing establishments.

Still more discouraging are the immediate prospects for the various maritime canal projects. The Panama Canal, upon which very large sums of money have been expended, has finally been abandoned, after many unsuccessful efforts of its projectors to raise the funds still required for its completion, and after, as a last resort, modifying the original plans of a sea-level canal to one with locks. But notwithstanding this momentary failure, I most sincerely hope—and I honestly believe—that it is yet reserved for American engineering skill and American enterprise to resurrect and successfully carry forward this great and important project to its ultimate completion.

The Tehuantepec Ship Railway, which, for the purpose on hand, may properly be classed with the maritime canals, has not met thus far with the encouragement which its importance and the unqualified indorsements of eminent professional talent would seem to justify. Probably the sad fate of its Panama rival, which places it for the present out of the range of active competition, may assist in reviving the ship-railway project to which our lamented fellow-member, the late Capt. Eads, devoted his energies during the last years of his useful life.

New interest is being manifested in the old ship-canal project across the Isthmus of Nicaragua, which, in the matter of demonstrable feasibility, undoubtedly has many points in its favor.

Among other ship-canal projects in active progress may be mentioned the Cape Cod Canal, which was commenced in 1880, and which will, when completed, connect the Bay of Cape Cod, by way of Herring River, with the head of Buzzard Bay in Massachusetts.

The magnificent success of the ship-canal at Sault Ste. Marie, not only as an engineering project but also as a commercial enterprise, has surpassed all expectations; and since its completion the traffic upon the northern lakes has been multiplied to such an extent that it has been found necessary to build an additional canal and a new lock of larger dimensions even than the one now in use. The direct impulse given by the completion of this canal to the lake navigation, and the indirect effect upon the general business of that region of country, have stimulated the work on the hydraulic canal at Sault Ste. Marie, from which great results are expected; and they have also hastened the operations in progress for deepening and widening the channels through the shallow parts of Hay Lake,

whereby the route from Lake Huron to Lake Superior will be considerably shortened and generally improved.

A project is now being agitated, contemplating a direct connection between Lake Superior and Lake Michigan across the narrow portion of the peninsula between Marquette and Escanaba, whereby the passage through the Sault Ste. Marie would be entirely avoided, and much distance saved for the traffic between Lakes Superior and Michigan.

In the extension of the river-walls in New York harbor, under the Department of Docks, large concrete blocks are being used, weighing from 60 to 75 tons, and requiring hoisting-machinery of extraordinary size and power to place them in position. Similar blocks are being placed in the walls along the lake-front in Chicago, where they have been found to resist effectually the action of the waves in places where all former methods of protection have failed.

Railroads.—Sixty years ago railroads were unknown in this country. At that time the population of the United States consisted of 12,000,000 people. To-day we operate 160,000 miles of railroad, and our population has increased to 60,000,000 people. In 1830 the aggregate wealth of the United States was less than \$1,000,000,000; at present it is estimated at \$56,000,000,000. Just how much of this phenomenal prosperity may be due to the railroads, it is, of course, impossible to conjecture; but it may be safely assumed that they have very largely contributed to the result. While the population has increased during the last fifty years about 350 per cent, the ratio of increase of the railroad mileage for the same period has been nearly four times that of the population, which would seem to indicate that they have not only supplied a want of the past, but have kept well up with the contemporaneous growth of the country, if they have not, indeed, advanced beyond its actual necessities. The railroad mileage of the United States is now fully one-half that of the total railroad mileage upon this globe, while our population is only about one-twenty fourth part, and our area of territory only about one-twentieth part, of that of the inhabited world.

You have all heard the familiar illustration about girdling the equator a dozen times, more or less, with our railroad-tracks; but it will no doubt please you to know, that, since you heard the statement last, enough additional rail has been laid to give the equator another twist; and I might further supplement the illustration by the assurance that we have now a sufficient supply of materials in the tracks of this country to build a railroad to the moon. Over these 160,000 miles of railroad we carried last year 475,000,000 people, and transported 600,000,000 tons of freight. Upon these lines are engaged 1,000,000 employees. Their equipment consists of 30,000 locomotives, 21,000 passenger-cars, 7,000 baggage-cars, and 1,000,000 freight-cars. The capital invested in their construction and equipment amounts to \$8,000,000,000, and the yearly disbursements for labor and supplies exceed \$600,000,000.

The creation of these vast properties has been accomplished by aggregation rather than by preconceived systematic development. The trunk lines of the present day are to a great extent composed of pieces of road originally built by local enterprises, and absorbed from time to time by lease or purchase, to constitute with other acquisitions, in connection with some specially constructed connecting links, the various systems under the management and control of the leading railroad companies of the country.

The recent revival of the temporarily abandoned Hudson River Tunnel project, and the proposed tunnel under the river at Detroit, are enterprises demanded by the necessity of continuous transportation lines for the through traffic of our railroads.

The numerous accidents which happen at points where public highways cross the railroads at grade, in spite of alarm-bells, watchmen, and safety-gates, have led to the enactment of laws in some of the Eastern States looking towards a gradual abandonment of existing crossings and the absolute prohibition of new ones in the future. During the years 1887 and 1888 there were abolished in Connecticut 93 grade-crossings, at a cost of \$625,000. In Massachusetts a special committee of the Legislature has recently reported upon this subject, recommending that all dividend-paying roads eliminate annually 5 per cent, and all non-dividend-paying roads 2½ per cent, of their grade-crossings at the joint expense of the railroads and communities, and that in future no grade-cross-

ings shall be permitted. It is to be hoped that the beneficial results of these wise measures will induce other States to take this subject under serious consideration.

The most noteworthy engineering feature in connection with the general progress of railroad construction in this country is the building of bridge structures upon a constantly increasing scale. In 1862 I triangulated the positions and laid the foundations for the piers of the channel span of the Ohio River bridge at Steubenville. This was the first iron railroad-bridge over any of the navigable tributaries of the Mississippi River. The length of its channel span was 320 feet, and it was the longest iron truss ever attempted up to that time. It was designed by Mr. J. H. Linville, still a member of this society; and it has carried in safety, and without accident, the traffic of one of the principal Western connecting lines of the Pennsylvania Railroad for twenty-five years, and is now being replaced by Mr. Henry G. Morse, also a member of this society, giving way to a double-track structure. To-day twelve railroad-bridges span the Ohio River between Pittsburgh and Cairo, and two more are in progress of construction. There are fourteen railroad-bridges over the Mississippi, and fifteen over the Missouri. Many of these structures have spans of 500 feet, and one of the projected bridges over the lower Mississippi was designed with a span of 730 feet; but this plan, I understand, has been abandoned, and a cantilever structure adopted in its place.

The erection of these large bridges has become a special business in this country, and the leading contractors engaged in that pursuit have acquired wonderful skill in the performance of this dangerous and difficult work. Few people appreciate the risks and hardships encountered, and the courage and judgment required, in dismantling an old railroad-bridge and erecting a new one in its place, with a deep and rapid river running underneath, a strong wind blowing, and a hundred trains passing daily over the frail, temporary supports, which must carry the traffic during the replacement. The mere erection of entirely new structures, free from the encumbrance of moving traffic, is considered an easy job.

In October last, the contractors engaged in the erection of the bridge at Cairo swung free and clear a 520-foot span in six days, and in November last the same parties erected the trusses of another span of 520 feet length in 44 hours, and more recently they erected a 400-foot span in 31 hours, the wind blowing a gale nearly all the time.

The successful completion during the past year of the Hudson River cantilever bridge at Poughkeepsie reflects great credit upon the builders and engineers in charge; and the equally successful completion and skilfully conducted erection of the Hawkesbury Bridge in New South Wales adds new fame to the same firm of contractors, whose leading partners are all prominent members of this society.

Whether the limit of possibilities in bridge construction will be reached in the execution of Mr. Gustav Lindenthal's design of a railroad suspension-bridge over the Hudson River, with a span of 2,800 feet, resting upon towers 500 feet high, and carrying, in addition to wagon-ways and foot-walks, six railroad-tracks, at a height of 150 feet above water; or whether the projected crossing of the British Channel will require still larger dimensions,—are problems which may perhaps interest at some future day the younger members of this society.

NOTES AND NEWS.

ACCORDING to an ancient superstition, says *Garden and Forest*, the beech is never struck by lightning; and so general has been this belief, that a gentleman recently thought it worth while to write to an English journal that he had been told of a lightning-shattered beech in Ireland. Beliefs of this sort are rarely without some degree of justification in fact, and it would be interesting to know whether in this country the beech has been observed to possess any greater immunity from electrical dangers than trees of other sorts.

—The *Gardeners' Chronicle* says that the ginkgo is proving itself one of the best trees for street-planting in smoky cities, thriving in the most impure atmospheres, and having as yet been attacked

by no insect or fungus disease. In this country, according to *Garden and Forest*, no extensive use has been made of the ginkgo as a street tree except in Washington, where of course it is not subjected to the test of an atmosphere impregnated with smoke. If it is, indeed, able to withstand the most unfavorable conditions, it might be more generally adopted; for it grows rapidly, its shape well adapts it for association with architectural forms, and the peculiar character of its foliage always makes it interesting to the popular eye.

— The true eating banana, or “madura,” is said to be unknown in northern countries, the varieties we import being simply those which are used in the land of their growth for cooking-purposes. *Garden and Forest* states that many varieties of the madura are recognized, each of which is distinct in flavor. The smaller are the more delicious; and the smallest of all, the so-called “lady-finger banana,” with a skin hardly thicker than paper, is the most highly prized. Green cooking-bananas are peeled, and roasted in the ashes, and eaten with butter; partially ripe ones are boiled for a few minutes with the skin on, and eaten with sirup or honey; and ripe ones are sliced lengthwise, and fried in olive-oil or butter.

— It will be new to some Americans, even though they know that peaches are commonly cultivated under glass in England, to be told that cherries are also grown in this manner. A correspondent of the *Gardeners' Chronicle* recently described the cherry-house at Gunnersbury Park, where many different varieties afford fruit at different times during the season. “When the trees are started into growth,” he says, “a temperature of 45° by day, and 40° by night, is maintained. When they are in flower, plenty of air is given, and the bees are encouraged to work among the blossoms as much as possible. Scarcely any fire-heat is employed: indeed, it had been employed only once or twice in order to keep out frost. At the time of flowering, plenty of ventilation is given, top and bottom. As soon as the fruit has set, the house is closed up somewhat, and the temperature kept quite cool until the stoning process is over; then it is kept a little closer, as when the fruit has stoned it ripens quickly. It is a little difficult to thin out the fruit previous to the stoning stage, as it is uncertain which fruit will mature, and which fail. A good watering is given to the trees before they get into flower, and then water is applied with moderation until the fruit has set. Cherries appear to do best, and set their fruit more freely, when somewhat dry at the roots, whether the trees are planted out or in pots, and it appears to be quite certain that all flower more freely when worked on the mahaleb than when on the cherry stock.”

— The following interesting report to the United States Hydrographic Office from the American steamer “Indiana,” Capt. W. I. Boggs, seems to indicate a normal condition of the Gulf Stream in the regions and during the times stated: “From noon of May 22 (latitude 40° 20' north, longitude 60° 8' west) to noon, May 23 (latitude 40° 46' north, longitude 54° 29' west), experienced a current setting N. 68° E., drift 16.4 knots. The temperature of sea was noted every two hours: maximum temperature, 72°; minimum temperature, 60°; mean temperature, 66°. From noon of May 24 (latitude 41° 15' north, longitude 49° 3' west) to noon, May 25 (latitude 43° 49' north, longitude 43° 47' west), current set N. 51° E., drift 23 knots. The temperature of sea was noted every two hours (and during hours of darkness every half-hour): maximum, 64°; minimum, 54°; mean, 62°; twenty-four observations being taken.” It is interesting to note, in this connection, that during the above period, and for fully a week previous, no general storms occurred in the regions referred to. On the contrary, the winds were variable in force and direction, seldom reaching a force of 6 (Beaufort's scale).

— Attention is called to certain changes that have been adopted on the “Atlantic Pilot Chart” for July, which, it is thought, will commend themselves to all who have occasion to use it. The most important of these is the enlargement of the area represented, the eastern limit being now 10° east longitude (instead of 4°, as heretofore). This allows the whole of the North Sea to be shown, more of the Mediterranean than before, and the entire Gulf of Guinea. The system by means of which the prevailing winds are

indicated in each ocean square has also been changed slightly. Instead of representing a north-east wind, for instance, by an arrow pointing *away* from the centre of the square at the *south-west* point of the compass, it is now represented by an arrow pointing *toward* the centre at the *north-east* point of the compass. This is regarded as more graphic than the old method, the point of each arrow giving, at a glance, the true direction of the wind (the point from which it blows).

— The Brooklyn Academy of Science, a society incorporated Aug. 22, 1888, has opened a free reading-room in their rooms in Warner Institute, Willoughby Avenue and Broadway, in that city. The various scientific journals will be upon the tables, and there is no charge to the public. Donations of papers will be greatly appreciated.

— A boiler may be inspected to-day and found to be safe under a working pressure of one hundred, and be weakened to-night by low water so as to be dangerous to-morrow with fifty pounds pressure. Yet, as the *Age of Steel* says, it may explode a month hence with sixty pounds pressure and plenty of water, but the cause is as certainly low water as if it had exploded when the water was low. There is but one sure remedy, and it is a simple one. Put on a real safeguard, something simple, which has been tried, and proven to be trustworthy.

— According to the *British Medical Journal*, the programme of the Leeds meeting of the British Medical Association in August next “is developing in such manner as to afford the ample promise of a meeting of great scientific as well as social interest, and one which will be worthy of the traditions of this great medical centre.”

— The sacred lotus (*Nelumbium speciosum*) has become established in a pond in New Jersey, and proves hardy, although the surface of the water is frozen over during the winter. The history of its planting, by E. D. Sturtevant, is given in *Garden and Forest* for April 10, with a fine photo-engraving of the spot, showing hundreds of open flowers.

— There seems to be every prospect, according to *Engineering*, that the efforts made by the French engineers to entertain the American party of engineers will be very successful. It is intended that an hour and a half or two hours should be spent in Calais to examine the new harbor-works there; and the special train which the Northern Railway of France has so liberally placed at their disposal will make a détour and stop near St. Omer, to give the engineers an opportunity of inspecting the great hydraulic canal-lifts. On the day after their arrival in Paris nothing official will be done, but on the following morning a formal reception will be held at the offices of the French Society of Civil Engineers. The party will then breakfast with M. Eiffel on the first story of the tower, and will afterwards ascend to the top in detachments. A part of this day will also be spent in an organized visit to the exhibition. The Ville de Paris has made arrangements for an excursion through the Paris sewers, and further visits to the exhibition and elsewhere will be paid. One of the most interesting of the latter will be the compressed-air installations of the Popp Company. Altogether, though the Paris programme is not yet complete, it is certain to be a very full, hospitable, and attractive one.

— *The Engineering and Mining Journal* says, “It will be remembered that some enterprising associated press agent startled the country a few weeks ago by announcing that the Standard Oil Company had wired from the Media works to Philadelphia for two hundred bull-dogs, which news item the telegraph editors and ‘home correspondents’ of some of the metropolitan dailies ingeniously enlarged into a small-sized sensation, lasting a day or two, until it was discovered that the ‘bull-dogs’ wanted were merely harmless lifting-jacks of a particular style. As an example of how so much remarkable literature is floated, observe the following judicial and editorial comment of one of our technical exchanges in its issue of June 22, at which late date it does not seem to have yet ‘caught on’: ‘The Standard Oil Company has, however, introduced a new style of watchman, which we think will be efficient. The company has suffered a good deal by tramps and loafers getting too near its tanks and smoking, and thus setting fire to the gas

generated by the oil, which ignites easily; and it has now given an order to a dog-fancier's association for two hundred bull-dogs, to range in age from six months to a year, the price to be fifteen dollars each. The dogs are to be placed where the company has distributing-stations, and used in the field to guard the large iron tanks that are full of oil. The bull-dog watchman certainly has this merit over the average biped private watchman, that he neither smokes, drinks, nor goes to sleep on watch."

— We learn from *Nature* that the Russian Academy of Sciences offers a prize of \$2,500 for the best inquiry into the nature and effects of the poison which develops in cured fish. The objects of competitors must be: "(1) To determine, by means of exact experiments, the physical and chemical nature of the poison which develops in fish; (2) to study, by experiments on animals, its action upon the heart, the circulation of the blood, the organs of digestion, and the nervous system; (3) to determine the rapidity of its absorption by the digestive organs; and (4) to study and describe the characteristics which may serve to distinguish contaminated fish from such as are not contaminated." The fifth and sixth questions, with which it may be impossible for any one to deal satisfactorily, relate to the means of preserving fish from the development of the poison, and to the question of counter-poisons and the medical treatment of poisoned persons. The competition is open to all. The memoirs must be sent in, either in manuscript or printed, before Jan. 1, 1893, and may be written in any one of the following languages: Russian, Latin, French, English, German. If none of the papers is deemed worthy of the full prize, the accumulated interest upon the above-named sum may be handed over to the author who presents the best solution of some part of the problem.

— Arrangements have been made for a daily exchange of telegraphic weather reports between Washington and Havana during the present hurricane season. Early and reliable information can be obtained at any branch hydrographic office.

— The forecast of weather on the Atlantic for July by the United States Hydrographic Office is that generally fair weather will prevail. Occasional moderate gales, frequently accompanied by electric phenomena, will be felt north of the 40th parallel; and West Indian hurricanes are apt to occur, especially during the latter part of the month. Frequent fogs may be expected over the Grand Banks, along the northern coast of the United States, and in the neighborhood of the British Isles. Icebergs are liable to be encountered in the vicinity of the Grand Banks, between the 46th and 53d meridians, as far south as latitude 42° 30' north. Field-ice should be looked out for to the eastward and southward of Newfoundland and off the coast of Cape Breton Island.

— On July 22 an electric exhibition will open at St. John, N.B., to last ten days. This is in honor of the opening of the Canadian Pacific Railway to St. John.

— The Canadian Pacific Railway, in spite of its northerly latitude, seems to have overcome the snow difficulty. The total detentions during the past winter from this cause were only seven hours, the snowsheds and split and glance fences protecting the line in a very perfect manner, though some very heavy avalanches fell in the Selkirks.

— People may walk until they are fatigued through the almost endless buildings on the Champ de Mars, and yet fail to find any great and striking object by which they would especially remember the exhibition of 1889. The place is filled with evidences of untiring industry and skill on every side, but there is a strange absence of great novelties. We believe, however, that the exhibition will be famous for four distinctive features, — in the first place, for its buildings, especially the Eiffel Tower and the Machinery Hall; in the second place, for its Colonial Exhibition, which for the first time brings vividly to the appreciation of Frenchmen that they are masters of lands beyond the sea; third, it will be remembered for its great collection of war material, the most absorbing subject nowadays, unfortunately, to governments, if not to individuals; and, fourth, it will be remembered, and with good cause by many, for the extraordinary manner in which South American

countries are represented. Several of those nationalities are beginning to put themselves forward as appreciable factors in the politics of the world, and, what is of more interest to the manufacturer, they constitute the richest and largest customers in European and North American markets. Especially this is the case with regard to agricultural machinery of all kinds, and those exhibitors are fortunate who are well represented in this respect.

— Mr. Henry William Bristow, F.R.S., died on Friday, June 14, at the age of seventy-two. In 1842, according to *Nature*, he was appointed a member of the staff of the Geological Survey of the United Kingdom. Mr. Bristow published various works on mineralogy and geology, and was the author of the mineralogical articles in Brande's "Dictionary of Science, Literature, and Art," and of articles on minerals and rocks in Ure's "Dictionary of Arts, Manufactures, and Mines." He became a fellow of the Geological Society in 1843, and of the Royal Society in 1862, and an honorary fellow of King's College, London, in 1863. He received the diploma of the Imperial Geological Institute of Vienna, and from the King of Italy the diploma and insignia of an officer of the Order of SS. Maurice and Lazarus.

— In reference to the destructive volcanic eruption on the Island of Oshima (better known to the Western world as Vries Island), it seems that the first news of it was brought to Yokohama by the master of a passing steamer, who described the mountain Miharaizan as being in fiercely active eruption on the morning of April 13. The eruption was of such a nature that it attracted attention on board the steamer at a great distance. Afterwards it was ascertained that the outbreak was at the western base of the mountain. From this it would appear that a new crater has been formed, as the old crater is at the top of the mountain, though there is a place to the south-west whence smoke is always issuing from the sands. The *Japan Weekly Mail*, from which this information is taken, gives the following historical account of this remarkable volcanic island. Miharaizan, according to the oldest Japanese historical records, was an active volcano so far back as 684 A.D., but the earliest authentic notice of its activity appears to have been taken in 1421, when the sea boiled, and the fish died in shoals. In 1684 an eruption commenced which lasted seven years; and in 1703 there was a great earthquake and tidal wave, and part of the island broke down, and formed the present harbor. In 1777 the mountain was in active eruption, and the island was covered several inches deep with ashes, such phenomena being almost constantly repeated from that date till 1792. It was then quiet till 1837, and more or less in action for the following twenty years. Another lull then took place, when, in 1868, it again broke out, and continued in action four days. The next eruption occurred in 1876, and lasted nearly two months. The most destructive eruptions of Miharaizan were probably those of 1781 and 1789, as during the latter the village of Shimotaka was entirely destroyed, and the people and their houses were completely buried in ashes. There are at present six villages on the island, containing a population of five thousand persons, mostly fishermen.

— Maria Mitchell, the well-known astronomer, until recently professor of astronomy at Vassar, died June 28 at Lynn, Mass. Miss Mitchell was born in Nantucket in 1818, and inherited her love of astronomy from her father, a bank cashier who made a hobby of astronomical investigations. It was one of Miss Mitchell's ambitions to discover a telescopic comet, — an ambition that was satisfied in 1847. For this discovery a medal was presented to her by the King of Denmark, although, doubting the reality of her discovery for a time, Miss Mitchell had delayed publishing it, — a delay which came near losing her the honor, as European astronomers had found the same comet, and made earlier publication. It was through the earnest presentation of her case by Edward Everett that the medal reached this famous woman astronomer.

— Theodore Dwight Woolsey, president of Yale College from 1846 to 1871, died July 1. He was born in New York, Oct. 31, 1801. Besides his Greek text-books, published early in his career, his sermons and essays, President Woolsey wrote the well-known "Treatise on International Law."

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

47 LAFAYETTE PLACE, NEW YORK.

SUBSCRIPTIONS.—United States and Canada.....\$3.50 a year.

Great Britain and Europe..... 4.50 a year.

Science Club-rates for the United States and Canada (in one remittance):

1	subscription 1 year	\$ 3.50
2	" 1 year.....	6.00
3	" 1 year.....	8.00
4	" 1 year.....	10.00

Communications will be welcomed from any quarter. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

VOL. XIV.

NEW YORK, JULY 5, 1889.

No. 335.

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THE SOUTHWARD MOVEMENT OF ICE on the Grand Banks during June was far more decided than for the same month last year and 1886, though scarcely exceeding that of 1887. The probable limit, as forecast on the "Atlantic Pilot Chart" for June, has been well reached in the area lying east of the 50th meridian. Since June 4 there were 16 reports of icebergs south of latitude 45°, and between longitudes 50° and 47½°. Of these, 11 reports fell south of latitude 44°. The southernmost one, a good-sized berg 40 feet high, in latitude 42° 54' north, longitude 49° 54' west, came near proving very serious to one big liner, who slightly struck one of its submerged spurs on a foggy evening, June 11. A few bergs are still coming down across the parallel of 50°, but the season on the southern half of the Grand Banks is drawing to a close, and the probable limit for July has accordingly been moved northward. The fact that the fog belt is so apt to overlap the iceberg region at this season makes it doubly desirable that transatlantic lines, both east and west bound, adopt a set of routes that will skirt rather than cross this dangerous field. Such routes are advocated on the "Pilot Chart," and the slight loss of time incurred by following them gives a factor of safety that must in time be recognized by underwriters. It is to be hoped that the coming international marine conference will give this question their wise consideration.

THE GRAIN PLANT-LOUSE IN OHIO.

ONE of the most notable insect-outbreaks that has occurred in Ohio for many years is now taking place in the grain-fields of that State. The insect is one which has long been known as the grain plant-louse (*Siphonophora granaria*), having originally occurred in Europe, whence it was probably introduced into this country early in its history. It has only occasionally ravaged grain-fields here, and, so far as our present information goes, has seldom been injurious in Ohio.

The insect is now present, however, in destructive numbers over a large portion of Ohio, having already seriously injured the wheat, and is now threatening an equally serious injury to oats and other grains. Last year it was present in many of the northern counties, not becoming sufficiently abundant to attract notice until the oats were nearly ripe.

This insect is closely related to the "green fly" of house-plants, rose-bushes, etc. It is a small, greenish, or in some cases brownish, insect, with or without wings, infesting the leaves and heads of plants of the grass family. It obtains its food by inserting a pointed beak into the leaf or stem, and sucking out the sap. As the wheat gets ripe, it migrates to the more succulent oats, and, when these ripen, will go to various grasses. It brings forth living young; and its rate of multiplication is very great, it being estimated that a single louse in spring may become the ancestor of many millions before autumn.

Fortunately this insect has a great many enemies which prey upon it, and are now doing immense good in decimating its ranks. These are of various kinds, and in some places are being mistaken for foes instead of friends of the farmer. The one which is causing the most apprehension is a peculiar dark-colored, six-footed insect, generally with spots of a brighter color on its back, looking, as one person expressed it, "half worm and half bug," which is very abundant in the infested wheat-fields, crawling about over the heads. These are the young or larvæ of various species of lady-bugs, or lady-beetles, and instead of attacking the wheat, as many farmers believe, is really feeding upon the lice themselves, and destroying them by thousands. Another insect that is doing immense good is a very small four-winged fly that deposits an egg within the louse. This egg hatches into a grub that develops at the expense of the louse, destroying it, and emerging again as a four-winged fly. The dead lice "struck" by these parasites become dull brown in color, and adhere to the leaf or stem upon which they were feeding.

Besides these, various other enemies are attacking the lice; and the indications now are that the outbreak will be so checked by the end of the season, that there will be little danger of a repetition of the attack next year.

The presence of English sparrows in the wheat-fields led some to believe that they were feeding upon the lice; but an examination of stomach contents of a number shot while on wheat, showed that the grain itself was what they were after, no more lice being eaten than was necessary to get the grain.

As yet no practical artificial remedy for the grain plant-louse is known. At the Ohio Agricultural Experiment Station at Columbus they have found that kerosene emulsion will destroy them; but the difficulty of reaching them with this substance, when they occur on the under surface of the leaf, or embedded in the chaff of the head, makes the remedy hardly practical. The injury to the wheat will be manifested by the shrivelling of the grain, due to the extraction of the sap necessary for its perfect development.

THE BRUCE PHOTOGRAPHIC TELESCOPE.

THE Astronomical Observatory of Harvard College has received from Miss C. W. Bruce of New York a gift of fifty thousand dollars, to be applied "to the construction of a photographic telescope having an objective of about twenty-four inches aperture, with a focal length of about eleven feet, and of the character described by the director of the observatory in his circular of November last; also to secure its use under favorable climatic conditions in such a way as in his judgment will best advance astronomical science."

This instrument will differ from other large telescopes in the construction of its object-glass, which will be a compound lens of the form used by photographers, and known as the "portrait lens." The focal length of such a lens is very small compared with its diameter, and much fainter stars can be photographed in consequence. The advantage is even greater in photographing nebulae or other faint surfaces. Moreover, this form of lens will enable each photographic plate to cover an area several times as great as that which is covered by an instrument of the usual form. The time required to photograph the entire sky is reduced in the same proportion. A telescope of the proposed form, having an aperture of eight inches, has been in constant use in Cambridge for the last four years, and is now in Peru photographing the southern stars. It has proved useful for a great variety of researches. Stars have been photographed with it too faint to be visible in the fifteen-inch refractor of the observatory. Its short focal length enables it to photograph as faint stars as any which can be taken with an excellent photographic telescope having an aperture of thirteen inches. The eight-inch telescope will photograph stars about two magnitudes fainter than can be taken with a similar instrument having an aperture of four inches. A corresponding advantage is anticipated from the increase of the aperture to twenty-four inches. Each photograph will be thirteen inches on a side, and will cover a portion of the sky five degrees square, on a scale of one minute to a millimetre. The dimensions will be the same as those of the standard charts of Chacornac and Peters. The entire sky would be depicted upon about two thousand such charts.

It is very important that the best possible location should be found for such an instrument. In Europe and in the eastern portions of the United States, where nine-tenths of the principal observatories of the world are situated, it is cloudy for a large portion of the year. Great advantages are expected from a location, as on some California mountain, where clouds and haze are seldom seen.

This generous gift offers an opportunity for useful work such as seldom occurs. It is expected that the Bruce photographic telescope will exert an important influence upon astronomical science by the large amount of material that it will furnish.

CHARITY AND KNOWLEDGE.¹

THIRTEEN years ago, during the centennial celebrations of Independence Day, the university founded by Johns Hopkins began its work; and now, as we commemorate a completed century of constitutional life, the hospital, gift of the same donor, throws open its doors. These buildings, on which thought, time, and wealth have been freely spent, are now consecrated to the ministry of mercy and the prolongation of life. Science and charity, knowledge and pity, skill and sympathy, are here installed in the service of mankind.

That large-minded citizen of Maryland, "who, by noble gifts for the advancement of learning and the relief of suffering, has won the gratitude of his city and his country," found two words adequate to his great ideas. "University" and "hospital" were his chosen terms, and he linked them together by this significant phrase: "Bear constantly in mind that it is my wish and purpose that the hospital shall ultimately form a part of the medical school of that university for which I have made ample provision by my will." How brief the phrase, how large the purpose! — "apples of gold in pictures of silver."

Like James Henry Roosevelt of New York, "a man upright in his aims, simple in his life, and sublime in his benefaction,"² whose hospital and dispensary give clinical instruction to the College of Physicians and Surgeons; like James Lenox of New York, whose munificence established a public library and gave birth to a hospital, — Johns Hopkins, already honored as a patron of learning, will be henceforward remembered in the annals of charity and

medicine. May we not almost say of him, as Pindar said of Theon (Olympic II., Cary's version), —

"And I will swear
That city none — though she unroll,
A century past, her radiant scroll —
Hath brought a mortal man to light
Whose hand with larger bounty flows.
The blessings to that man we owe,
Say, who shall hope to count?"

We may form an idea of what this hospital may become by the study of a like institution in London. About a century and a half before Johns Hopkins died, the days of Thomas Guy were ended. Like our benefactor, he had lived unmarried to the age of eighty years, and from humble beginnings had acquired a fortune, with which he provided for the establishment of a hospital. The amount of his gift was more than a million dollars (£238,292). The beneficent influences of Guy's Hospital are now known in every part of the globe. It is doubtless safe to say that every one of us has shared, indirectly, in its benefits. The name of the great surgeon, Sir Astley Cooper, would alone give renown to the hospital to which he was attached, — Sir Astley Cooper, of whom it was said that from the period of his appointment to Guy's, until the moment of his latest breath, he was every thing and all to the suffering and afflicted; his name was a host; but his presence brought confidence and comfort.¹ Addison and Hodgkins, whose names are familiar to the historians of medicine, were physicians in that hospital: so was Richard Bright, whose discoveries have been pronounced the most important contribution to medical science made in the first half of the nineteenth century. The observations and studies made in Guy's Hospital since 1836 fill fifty volumes. Thousands of medical students have been trained within its walls. "Their presence," says a competent observer, "has made the hospital." Hundreds of thousands of patients have received relief from the treatment there afforded. In a single year, five thousand in-door patients have been cared for, and more than thirty thousand out-door patients have sought advice.

But we are planning for a future much longer than a century and a half; for a history as long as that of St. Bartholomew's or St. Thomas's, which now, after many centuries, are more useful than ever.

By a curious coincidence, as I had reached this point in the preparation of my address, I received a volume from Dr. Norman Moore, the warden of St. Bartholomew's Hospital in London, bearing an inscription so welcome and so apposite, that I will read it: "To the library of the newest of hospitals, this account of the progress of medicine in one of the most ancient is given by Norman Moore — with the earnest hope that the Johns Hopkins Hospital may flourish at least as long as the Royal Hospital of St. Bartholomew in Smithfield, and prove no less useful to mankind — on the opening day of the Johns Hopkins Hospital, 1889."

This little book is full of suggestions for us. First, as to the longevity of a hospital. "For more than seven hundred and fifty years the hospital has flourished upon its present site; and its Smithfield gateway, through which passed men of the generation whose fathers saw William the Conqueror enter London, has ever since been open to the sick poor."

Then as to the progress of medical science. Here you may see "how the physician grew from a schoolman into a scientific observer, and how the surgeon, who appeared on the scene in livery and without learning, grew from a handicraftsman to be a man of science."

Next as to the training of illustrious men. Here you will find a record of the names and services of Caius, Bernard, Pott, Abernethy, Lawrence, and Paget; you may learn that Dr. Thomas Young, the originator of the undulatory theory of light, was here a student; and you will come upon the story of one more famous than any person I have named, — the discoverer of the circulation of the blood, the illustrious Harvey.²

¹ Letter of Dr. Roots in the Memoir of Sir A. Cooper.

² Dr. Moore calls attention to the fact that it was a fund given by Dr. Caius to encourage the study of anatomy, which was the immediate means of leading Harvey to his discovery and also to a remark in one of Harvey's lectures that it was a passage of Aristotle which first suggested to him the idea.

¹ An address by Daniel C. Gilman, delivered at the opening of the Johns Hopkins Hospital, Baltimore, Md., May 7, 1889.

² This phrase (like that above, referring to Johns Hopkins) is taken from a memorial tablet.

Time may efface the personality of our founder, as it has effaced the personality of Rahere, the founder of St. Bartholomew's; but the beneficence of Johns Hopkins will last for centuries, and gratitude will cherish the memory of his broad views, his great liberality, his wise and beneficent purposes.

The previous speakers have told us of the circumstances which led to the construction of these buildings, and have described their purposes. Let me, from a different point of view, point out some of the benefits which are likely to proceed from this foundation. As I enter upon this theme, I am reminded that in 1789, John Howard, *facile princeps* among modern philanthropists, published in a quarto volume, just before his death, the observations he had made upon the lazarettos of Europe. That was the beginning of reforms in prisons, asylums, refuges, and hospitals. To this work he prefixed these words of Cicero (*De Oratore*, I. 8), a motto so appropriate that I might take it for a text: "*Quid tam porro regium, tam liberale, tam munificum, quam opem ferre supplicibus, excitare adfectos, dare salutem, liberare periculis.*"

First, last, and always, this hospital is to furnish relief to the sick and wounded. Make the best of it, introduce fresh air and sunshine, and provide the utmost comfort; secure wise physicians, engage the best trained nurses; decorate the walls with pictures; bring fruit and flowers, and books and friends, and even the comforting influences of religion, — yet you cannot conceal the direful consciousness that this is the home of suffering.

" From any other ill
(Except it be remorse) can men escape
By work, — the healing of divinest balm
To whomso hath the courage to begin, —
But sickness holds the sick man in a chain
No will can break, or bend to earthly use."¹

The names that have been given to these abodes of the sick are suggestive. "Hospitality" and "hospital" alike suggest the bestowal of kindness to guests. The word "lazaretto," ultimately degraded, pointed at first to the restoration of life. "Misericordia," "La Charité," "La Pitié," "The Home of the Good Samaritan," "The House of Mercy," bring to mind the kindly influences of love and care. St. John, St. Thomas, St. Bartholomew, and St. Luke, above all other apostles, are favorite patronymics. Paracelsus died in the Hospital of St. Sebastian. Bethlehem, Bethany, Bethesda, and Jerusalem recall the scenes where the great Physician was present. The name of Christ has been given to many a foundation. In other places the hospital shares with the temple the name of "Hôtel-Dieu," or "House of God."

By whatever name it may be called, this is a convent where sickness is the abbess. The rule of sympathy for the suffering must govern everybody with a strictness of discipline as rigid as the rule of the Benedictines or the Carthusians. Those who daily walk these cloisters will be the warders of life and health, however high their station, or however humble their service; and casual visitors will not cross the threshold of the wards without pity for those who are disabled, or without admiration and gratitude for those whose lives are spent in alleviating distress.

This hospital will not only meet the daily calls of humanity, it will stand ready to render extraordinary services in those emergencies which not even the progress of municipal reform and preventive medicine can entirely ward off. A fire, an explosion, an accident on the rails or on the seashore, the fall of a platform or of a building poorly constructed, may at any moment tax the utmost resources of a great establishment. True, we have no fear of leprosy and the plague; we have almost ceased to dread the coming of the cholera; yellow-fever we are hoping to thwart in its approaches to our Northern seaports (vaccination, which was spoken of by Sir James Simpson "as the greatest thought ever broached in practical medicine," is a great prophylactic); but we are not certain that diphtheria and infectious fevers will not continue to be epidemic; nor can we always be sure that the boards of health in the city and State will succeed in protecting us, as well as they can, from the inroads of pestilence. Indeed, it is well to inquire whether Baltimore is now fortified as it should be against the hostile incursions of epidemic disease. In addition to its other func-

tions, this hospital will stand as a reserved force, — a sort of store-house of energy, ready to serve the city if apprehension and disease spread their pall upon it.

Here let me say, in anticipation of the future and in memory of the past, that, in all the records of bravery on land and sea, none are more noble than those of the medical profession. Free from all excitement, free from the hope of reward, free from any commands but those which are divine, they have in times of pestilence gone from bed to bed, firm, fearless, faithful, carrying the offerings of cheer, comfort, and relief, and often of restoration to health and vigor. For them there is no repose in time of danger. The black wings of death hovering over a city do not deter them from duty; and often it may be said of them, as Milton said of Abdiel, "faithful found among the faithless," faithful only they. Read the annals of modern pestilence, of cholera in New York, of fever and famine in Ireland, of yellow-fever in the South. Everywhere it is the same story. The more direful the record, the more unflinching, the more self-forgetful, the more humane, are the efforts of physicians.

While the offices of a hospital are bestowed without money and without price on those who are destitute, those who are able to pay for suitable attendance, and for the domestic comforts to which they are accustomed, may discover that they can here be better treated than in many private houses. The conditions of quiet are more easily secured; suitable diet at unusual hours can be commanded; medical attendance is within call at every moment of the day and night; manifold appliances for relief are more readily obtained. More and more frequently travellers, students, all whose homes are in hotels and boarding-houses, and even many who have good private homes, turn toward good hospitals when they see the need approaching for prolonged and special care. For the wants of such persons, provision has been made in the wards here set apart for paying patients, male and female.

This hospital would be a very narrow institution if it kept to itself its experience. It is the essence of quackery to deal in mysteries and nostrums: it is the glory of medicine that it owns no patents, and conceals no discoveries. On the contrary, the best hospitals of the world consider it one of their first duties, second only to the care of their patients, to record the cases they have treated, the methods they have pursued, the results, whether favorable or unfavorable, which have followed. Scientific studies in pathology and practical medicine must be printed. Special papers, often requiring costly illustrations, must be published upon extraordinary cases, and upon new operations and modes of relief. It is thus that the science of medicine is advanced. Where secrecy reigns, carelessness and ignorance delight to hide: skill loves the light.

It is impossible to have a hospital without its becoming a place for medical education. It is interesting to note that in the physician's oath, attributed to Hippocrates, the duty of imparting knowledge is explicitly enforced. Even the country doctor, as he rides from village to village, takes in his gig an observing pupil, like the squire to a knight-errant. Every great surgeon is watched with the closest attention by the younger physicians who assist him. Every mother is the pupil of the physician whom she calls upon to attend her suffering child. So, of course, a hospital, having upon its staff men of rare qualifications who are in daily consultation with their most skilful brethren, is, from the necessities of the case, a place for instruction. How systematic that instruction will be, depends on circumstances that at the moment need not be presented. All that need now be said is, that hospitals the wide world over are the schools of medicine and surgery.

The training of nurses is another form of hospital activity, recently developed, never hence to be abandoned. To the sisterhoods of the Roman Catholic Church, to the Protestant Deaconesses of Kaiserswerth and the Bethanien at Berlin, and to many guilds in many lands, much credit is due for lessons they have taught the world as to the importance of training nurses. Elizabeth Fry was one of the first Englishwomen to propose such instruction. Florence Nightingale, by her services in the Crimean war and by her subsequent writings, has borne a noble part in this work. So, too, have our own countrywomen. The civil war, full of sad recollections, has some bright stories, and among them none

¹ Ugo Bassi's Sermon in the Hospital, p. 13.

more inspiring than the labors of brave, self-sacrificing, and intelligent women in the hospitals. Who that has read "What we did at Gettysburg," or "Hospital Days," has forgotten their lessons? As a direct result of the war, nurses' schools have grown up in every part of this land. Our hospital has such a department soon to be opened, where nurses will be trained, not only for their merciful offices within these walls, but for household engagements, and for visiting among the poor.

A good hospital may readily become the rallying-place of the medical profession who are resident in the city.

"Through mutual intercourse and mutual aid
Great deeds are done, and great discoveries made;
The wise new wisdom on the wise bestow,
Whilst the lone thinker's thoughts come slight and slow."

One purpose of this central building is to afford opportunities for professional intercourse. Here are rooms set apart for the library that will presently be collected; here the medical journals will be taken in; here are the best appliances and instruments for the treatment of patients; here are rooms for private consultations and for public conferences; here are laboratories for physiological and pathological determinations; and it will not surprise me to hear that within a very short time medical associations are here brought together "for mutual intercourse and mutual aid" at the invitation of Dr. Osler, the physician-in-chief, who this day assumes his great responsibility with the hearty welcome of Baltimoreans, and with the well-earned confidence of the profession throughout the entire land.

Reference must also be made to the lessons that this hospital has already given to the world, before a single patient has been received. The vast amount of thought bestowed upon these buildings, not only in their general arrangements, but in thousands of details which promote their efficiency, has not failed to attract the attention of observers from every part of the globe. The letters which have been received during the last few days from the most distinguished surgeons and physicians abroad, and the presence of this large body of medical men from the distant cities of the United States, are indications of this interest.

Finally, if this hospital becomes the seat of knowledge in all that pertains to the nature of disease, its treatment, its prevention, and its cure, it will of necessity be a constant guide to the people of the city and the State in which it is placed; it will promote the general health of the inhabitants. There is an altar in one of the churches of Messina which bears an inscription to Æsculapius and Hygeia, the god of medicine and the goddess of health; and their statues are found together on the façade of Guy's Hospital. May they always be associated in Baltimore!

Is all this outlay wise? I might answer an inquirer in the words which Wordsworth employed in speaking of King's Chapel, one of the most costly structures in the University of Cambridge:—

"High Heaven rejects the lore
Of nicely calculated less or more.
Tax not the royal saint with vain expense;
With ill-matched aims, the Architect who planned
This glorious work of fine intelligence."

For in this hospital, as in that church, are

"Thoughts whose very sweetness yieldeth proof
That they were born for immortality."

But I prefer to give a more specific and appropriate reply to those (if any such there be) who say, "I believe in every thing that is practical, in whatever leads to the relief of suffering; but I am afraid of this talk about science. I would rather see a thousand beds for patients than any provision for medical education." Such reflections are to be heard with respect, for they are natural to minds unacquainted with the intimate relations which subsist between the progress of medical knowledge and the progress of medical art. Nevertheless it is true that those who have most carefully studied the conditions by which human life is perpetuated, human sufferings lessened, and human vigor increased, are well aware that every step forward in science leads to many forward steps in practice. May I endeavor to be a mediator between these two divergent views, and bring a few illustrations from the doctor's shop to the attention of those who are practically interested in hospitals,

but who have paid no attention to the steps, so slow, so difficult, so uncertain at first but so sure at last, by which the healing art makes progress.

The late Dr. Austin Flint of New York, in an address prepared near the close of his life, has pointed out with the wisdom of experience the probable future of medicine. It would be presumptuous for me to attempt to do again what he has done so recently and so well. But on this day of promise, in view of all this expenditure, it is fitting that we should bring to mind some inspiring thoughts.

Let us first consider the benefits which have come to mankind from the opportunities which hospitals have afforded for the observation of disease. There is no one among us more competent to speak upon this subject than the pathologist of this hospital, Dr. William H. Welch, who, years in advance of its opening, has been engaged as a professor of the university, in the study of the nature and origin of disease. He has called my attention to these noteworthy points:—

"Those who have contributed the most to the advancement of practical medicine and surgery have accumulated their experience largely in hospital service. By the constant attendance of skilful physicians and of well-trained nurses in hospitals, precise observations can be made, and the phenomena of disease and the influence of treatment determined, under the most favorable conditions.

"Our present knowledge of the natural history of disease, of its diagnosis, prognosis, and treatment, are based to a very large extent upon experience derived from hospitals. Text-books, monographs, and medical journals incorporate this experience, and bring it to the knowledge of the medical profession. This is why intelligent physicians are always eager to secure the advantages of a hospital service."

The benefits which medicine has received from purely scientific investigations may be shown by so many examples, that it is difficult to make a selection among them. Dr. Welch mentions these:—

"Upon the foundation laid by Helmholtz's researches in physiological optics, and his discovery of the ophthalmoscope, the art and science of ophthalmology have developed into the most accurate department of clinical medicine.

"The investigations which received their impulse from Du-Bois Reymond in the difficult subject of animal electricity have rendered electricity available for diagnosis and treatment, and have advanced thereby our knowledge of nervous diseases.

"Of the many ways in which the work of the chemist has aided medicine, may be cited, as one of its most recent contributions, the introduction into modern therapeutics of many useful remedies which are the products of synthetic chemistry. Doubtless this is a field which will be cultivated still further, and it would be rash to attempt to foretell what agents for the cure of disease and relief of suffering are still hidden in the chemist's laboratory.

"By the discovery of the specific germs causing various infectious diseases, surgical practice has been revolutionized. It has become possible to prevent the infection of wounds from the exterior, and thus to guard against a host of traumatic infections which rendered dangerous and futile so many surgical operations. Preventive medicine has taken its place among the exact sciences.

"Accurate knowledge of the causes of disease now forms a sure basis for intelligent therapeutics, and there is every reason to expect that the future will bring to light means to overcome the injurious agents which are now, for the first time, known."

But there is another illustration so marvellous that it may almost be called miraculous. The relations of advancing knowledge to advancing charity are brilliantly displayed by the history of methods for the relief of pain.

To put a stop to suffering is an instinct of human nature, distinguishing man from animals. The most scientific men, and the most practical, are agreed upon this, and have been so agreed for centuries. But Anæsthesia, most welcome of all the angels of mercy, came down from heaven. When the older surgeons in this assembly were students, opium and alcohol were the imperfect anæsthetics most usually employed. Their use was restricted and unsatisfactory, if not dangerous. No one can tell what was suffered in places where gentle sleep now quiets apprehension, and

makes the patient unconscious of his state. To this alleviation we are so wonted, that we accept it as the air we breathe. But if you would learn how man secured this boon, how many efforts of scientific and of practical men were combined before the results were reached, recur to the history of four modern agencies, — nitrous oxide, ether, chloroform, and cocaine, — which are like “the gentle dew from heaven, which blesseth him that gives and him that takes.” It is a chapter more wonderful than any romance of the Arabian Nights.

Let any one present who is sceptical in respect to the usefulness of science to the healing art keep this record in his mind. Let him reflect on the apprehensions that have been removed not only from the patient, but from his attendant friends; let him see how much easier, and therefore how much more certain, the task of the surgeon has been made; and, above all, let him think of the hours of pain that have been absolutely annulled: and then let him divide the honors, if he can, which belong to science, from those which belong to philanthropy. Let him balance half a century of scientific relief with the previous practice of many thousand years: then let him tell us which is better.

From the past let us turn to the future. All the signs of the times point to a new era in the history of mankind. All the sciences are leading up to a better understanding of the laws of life, to a true anthropology, and the consequent improvement of the physical, mental, and moral powers of man.

There are four or five directions toward which we may turn an expectant gaze, as in days gone by the merchants watched upon the house-tops for the return of the ships they had sent out to distant ports.

Preventive medicine promises to do more and more for mankind. As the germs of many specific disorders have been discovered, so the means of their destruction have been found out. If legislation and civil administration keep up with science, if knowledge is controlled by virtue and followed by temperance, the community will be freed from many of the foes which in former generations have slain their tens of thousands.

From the chemical laboratory new remedies, as well as simpler forms of old remedies, are to be constantly looked for. The synthetical processes which now receive so much attention have lately made important contributions to the pharmacopœia. It would surprise any one whose attention has not been directed to this point to know how many claimants are awaiting judgment. Scores of substances, till lately unknown, as I have heard my colleague Professor Remsen say, are awaiting the study of competent therapeutists. Nobody can foretell what will come from their new contributions to *materia medica*; but one who watches the processes of discovery must feel certain that secrets hid from the beginning are ere long to be revealed, and that many of the substances already discovered have properties of the most serviceable character.

No one can say what will result from the attention that has been recently given to the study of psychical phenomena by the exact methods of science, but the outlook is hopeful. If we are as far as ever from elucidating the mysterious inter-relationship of the mind and the body, progress has certainly been made in a knowledge of the laws by which they act upon each other. The knowledge that has been required in respect to the functions of the brain and nervous system has already led to the treatment of many disorders, and the relief of many diseases, which a short time ago were beyond the reach of remedy. We are not without hope that in the physiological and psycho-physical laboratories already established here, important contributions will be made to science which will ultimately prove to be of value to medicine, and to the conduct of the body in health and disease.

Medical appliances and surgical instruments are greatly to be improved. A surgeon who has just returned from Europe, after visiting in the interest of this hospital the most celebrated instrument-makers, has informed me that the processes of manufacture even now are behind the devices and requirements of surgical science. The hands of the artisan have not kept up with the brains of the surgeon. It is not possible to buy ready made the instruments required by this hospital.

In the near future we are to look for progress in the applications of electricity and magnetism to the treatment of disease as well as

to its diagnosis. Chemistry, by its synthetic methods, is producing new remedies, which experimental therapeutics proceeds to test, and pharmacy then appropriates. The laws of light, heat, electricity, and magnetism, are found in close relationship to the problems of relief and cure. The laws of temperature and climate have their services to render. Even the influence of barometrical pressure upon surgical operations begins to be noticed. The study of the nervous system is sure at no distant day to make important contributions to the welfare of man. Psychology is waiting for the results. Experimental physiology is doing its part. Pathology, a term as old as Hippocrates, has become a new science within the last few years. The laws of descent have but just begun to assume a scientific form. Preventive medicine is almost a new conception. The morality of personal hygiene is a new department of ethics. Biology, after having met with the same critical reception with which anatomy, astronomy, geology, and chronology were greeted, may yet be honored as leading to the highest and noblest conceptions of humanity. Anthropology, and the knowledge of man in his relations to the universe in which he is placed, may sum up finite knowledge.

So all along the line, in the laboratories of the university and in the wards of the hospital, knowledge is contributing to the welfare of man. The days of the coming man may not always reach the full allotment to which Chevreul has just attained; but perhaps to die at seventy will be to die in youth, and to reach the age of eighty or ninety in health and vigor will be the rule, and not the exception. Nor is length of days our only hope. The disappearance of epidemics; fewer days of confinement in sickness; fewer “minor ailments;” a decrease of infantile mortality; greater powers of resistance to the evils of certain occupations, and comparative immunity from many infirmities which are now common; artificial re-enforcements and replacements of bodily defects; simpler and surer means of diagnosis; the detection of the nature, origin, and history of specific affections; and finally the assurance of euthanasia, — these, as it seems to a layman, are reasonable expectations which the nineteenth century holds out to the twentieth. Can any outlay be too great if humanity is thus benefited?

To the attainment of these noble aims — “the relief of suffering and the advancement of knowledge” — the foundations of Johns Hopkins are forever set apart. On the one hand stands the university, where education in the liberal arts and sciences is provided, and where research is liberally encouraged; on the other hand stands the hospital, where all that art and science can contribute to the relief of sickness and pain is bountifully provided. Is there any thing wanting? Yes, there is still a great want to be supplied, an arch to rest upon these pillars. An institute of medicine and surgery, a college of physicians and surgeons, a medical school the office of which shall be to promote the training of young physicians and the encouragement of medical science, is imperatively needed. Is it too much to say that there is not such an opportunity on the face of the globe for another Peabody or another Hopkins to benefit his fellowmen?

The university needs all it has, and more, to carry on the non-professional courses to which its funds are appropriated. The hospital, with all its readiness to co-operate in the advancement of knowledge, will, after all, remain — as I have said before, and cannot say with too much emphasis — the home of the sick, the feeble, the injured, and the dying. It is the house of mercy, not the hall of philosophy. But in close alliance with both these foundations there is a place for a school of medicine, which may bear its founder's name, and may render services as significant and memorable as those of Salerno and Bologna, at the beginning of the modern era; as those of Leyden and Edinburgh, where the earliest American physicians received their education; or as those of Berlin and Vienna, to which so many students of this decade resort.

This grateful city should no longer delay placing upon one of the squares near the monument of Washington the figure of Johns Hopkins, with such designs as an artist, and an artist only, could devise, to typify the great ideas which underlie his gifts, — “the advancement of knowledge and the relief of suffering.” Then might some friend of this hospital place beneath this dome a copy of Thorwaldsen's “Christus Consolator,” with the outstretched

hands of mercy, to remind each passer-by — the physician and the nurse, as they pursue their ministry of relief; the student, as he begins his daily task; and the sufferer from injury or disease — that over all this institution rests the perpetual benediction of Christian charity, the constant spirit of "good will to man." Upon one hill of Baltimore rises a temple "whose guardian crest, the silent cross," is an emblem of the Christian faith; upon another a lofty column reminds us of the patriots' hope; upon a third the Hôtel-Dieu is placed, — the house of charity. Significant triad! Here "abideth faith, hope, charity, . . . but the greatest of these is charity."

BOOK-REVIEWS.

Economic Value of Electric Light and Power. By A. R. FOOTE. Cincinnati, Robert Clarke & Co. 16°. \$1.

THE author of this little book claims that the spirit moved him, as it were, to write it *pro bono publico*. The book is essentially a collection of papers read before scientific societies, and extracts from magazine articles on the applications of electricity for producing light and in the transmission of power. Mr. Foote is a strong believer in the future of electricity as an agent in furthering human comfort, and we doubt not that many who may be pondering on the question of introducing electricity in their homes or factories will find valuable suggestions within the covers of this book. In an appendix is given a glossary of electrical terms for the benefit of unprofessional readers.

Treatise on Trigonometry. By W. E. JOHNSON. London and New York, Macmillan. 12°. \$2.25.

THIS work is intended for both those who are beginning the subject and hope to continue their mathematical studies, and those

who wish to revive their knowledge of trigonometry and to extend it beyond the limits of the ordinary text-book. The treatise is so written as to make a good introduction to much of the higher mathematics; Chapter IX., on the geometry of the triangle, being sure to help those desirous of entering upon modern geometrical developments, and the final chapter presenting a fair view of the transition from the earlier interpretations of $\sqrt{-1}$ to the quaternions of Hamilton.

AMONG THE PUBLISHERS.

HARPER BROTHERS published last week H. Rider Haggard's story of "old and mysterious Egypt," entitled "Cleopatra: being an Account of the Fall and Vengeance of Harmachis, the Royal Egyptian, as set forth by his own Hand." The book is profusely illustrated from drawings by Mr. Greiffenhagen and R. Caton Woodville.

— D. Lothrop Company have issued recently, among many other books, "One Voyage," a story of life at sea from the passenger's point of view, by Capt. Julius A. Palmer; also a pictorial "History of England in Rhyme," and a similar one of the United States. Later they will publish new editions of "Art for Young People" and "Adventures of the Early Discoverers," by Mrs. F. A. Humphrey.

— The J. B. Lippincott Company have in preparation "Elementary Lessons in Heat," by Professor S. E. Tillman, of the United States Military Academy; and a new subscription-book entitled "A Manual of Machine Construction," a practical reference-book for the design, proportions, and method of constructing all kinds of machinery in common use, with all required references for the use of engineers, draughtsmen, and mechanics, by John Richards.

Publications received at Editor's Office,
June 17-29.

- ALDEN'S *Manifold Cyclopaedia of Knowledge and Language*. Vol. XIII. Electricity to Exclaim. New York, J. B. Alden. 12°. 50 cents.
- BLANFORD, H. F. *A Practical Guide to the Climates and Weather of India, Ceylon and Burmah and the Storms of Indian Seas*. London and New York, Macmillan. 369 p. 8°. \$3.50.
- DORIOT, SOPHIE. *The Beginners' Book in German*. Boston and London, Ginn. 273 p. 12°. 90 cents.
- GEPP, C. G., and HAIGH, A. E. *A Latin-English Dictionary*. Boston, Ginn. 563 p. 12°. \$1.40.
- LIGHT on the Path, with Notes and Comments by the Author. Written down by M. C. Boston, Theosophical Book Co. 68 p. 16°. 30 cents.
- LOEWY, B. *A Graduated Course of Natural Science*. Part I. London and New York, Macmillan. 151 p. 16°. 60 cents.
- MEADOWCROFT, W. H. *The A B C of Electricity*. New York, Lovell. 108 p. 12°. 50 cents.
- PENNSYLVANIA Geological Survey. *Catalogue of the Geological Museum*. Part III. Harrisburg, Geol. Surv. 260 p. 12°.
- *Atlas Northern Anthracite Field*. Part III. Harrisburg, Geol. Surv. 8 maps. 16°.
- *Atlas to Reports HH and HHH*. Harrisburg, Geol. Surv. 56 p. 5 maps. 8°.
- PLATO'S *Protagoras*; with the Commentary of Hermann Sauppe. Tr. by James A. Towle. Boston and London, Ginn. 179 p. 12°. \$1.50.
- SMITHSONIAN INSTITUTION. *Annual Report of the Board of Regents of the, for the Year ending June 30, 1886*. Part I. Washington, Government. 878 p. 8°.
- Two Great Retreats of History. I. The Retreat of the Ten Thousand. II. Napoleon's Retreat from Moscow. With Introduction and Notes by D. H. M. Boston, Ginn. 318 p. 16°. 60 cents.
- U. S. WAR DEPARTMENT. *Annual Report of the Chief Signal Officer of the Army to the Secretary of War for the Year 1888*. Washington, Government. 418 p. 8°.
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JULY, 1889.
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HEAVEN AND HELL, by EMANUEL SWEDENBORG, 416 pages, paper cover. Mailed pre-paid for 14 Cents by the American Swedenborg Printing and Publishing Society, 20 Cooper Union, New York City.

—The opening article in the *Political Science Quarterly* for June is by Albert Shaw, on "Municipal Government in Great Britain." It is not a history, but an account of the existing system of municipal government, which differs in important respects from that prevailing in the United States. The governing authority in British cities is the Common Council, the members of which are chosen by districts, and which has the appointment of the mayor and other administrative officers. The mayor is always a member of the council, and holds office for only a short time, while the other appointive offices are held for life. Mr. Shaw thinks this system greatly superior to the American, because it centres both power and responsibility in what is really a committee of the citizens, while in America responsibility is practically destroyed by the division of power and the complicated system of checks and balances. He also disapproves giving the mayor of a city such great power as the mayor of New York now wields, and remarks that "the one-man power is on the decline everywhere in this age." The article ought to be read by every American who is interested in municipal affairs. The next paper in the *Quarterly* is by J. H. Dougherty, on the "Constitutions of New York," the first part of which was published in September of last year. It is purely historical, and contains nothing specially new or striking. Another historical paper is that of J. W. Jenks on "The Whiskey Trust." The writer does not inquire into the legality of the trust nor into its economic effects, but merely relates the circumstances of its formation and development; and those wishing for information on these points will find it in this article. Mr. E. P. Cheyney discusses the recent decisions of the courts in "Conspiracy and Boycott Cases," and thinks that they have been too harsh against the labor-unions. He believes the judges have been too much influenced by legal precedent, and have not given sufficient attention to the changed condition of industry and society. Mr. F. W. Whitridge writes on "Rotation in Office," strongly condemning the United States law which provides that all officers appointed by the President and Senate shall hold office for only four years, which he justly holds to be one of the main supports of the spoils system. Besides these essays and a number of book reviews, the *Quarterly* contains a "Record of Political Events" from October to May, which is evidently the continuation of those formerly published in the *New Princeton Review*, which has now been merged with the *Quarterly*.

—Professor W. G. Sumner is to contribute to the *Popular Science Monthly*, as the opening article of the July number, a discussion of the question, "What is civil liberty?" in which he reviews the ideas of liberty that have prevailed, and the relations that rights and duties have borne to each other, in the past, and points out the tendencies that threaten civil liberty in the present. "Christianity and Agnosticism" is the title of a further reply to Professor Huxley, by Rev. Dr. Henry Wace, which will be printed in the July issue. In this paper Dr. Wace undertakes to show that his opponent's latest arguments are evasive and involve numerous fallacies; he also courteously criticises Mrs. Humphry Ward, whom Professor Huxley had cited with approval. What man has done and may do to lessen or increase the abundance of those food-fishes that have the wide ocean for their home, is told in an article on "The Artificial Propagation of Sea-Fishes," which Professor W. K. Brooks will contribute; and the railway problem now before the country will be treated by Mr. Benjamin Reece, under the title "Railway Maladjustments." Mr. Reece maintains that our laws favoring railroad-building have produced an excess of roads, which must be either a loss to the investors or a burden to the public, and that the Interstate Commerce Law is a clumsy expedient which takes little note of the working of economic forces.

—D. C. Heath & Co. will publish, July 20, "An Introduction to the Study of Shakspeare," by Hiram Corson, professor of English literature, Cornell University. It will be an attempt to indicate to the student some lines of Shakspearian study which may serve to introduce him to the study of the plays as plays. The commentaries presented on "Romeo and Juliet," "King John," "Much Ado about Nothing," "Hamlet," "Macbeth," and "Antony and Cleopatra," aim chiefly to present the points of view which are demanded for a proper appreciation of Shakspeare's general attitude

toward things, and his resultant dramatic art. An attempt is made to show the moral spirit with which he worked, as distinguished from a moralizing spirit, which it seems all-important to appreciate. Herein consists the transcendent educating value of the plays. To come into the fullest possible sympathy with this moral proportion, with this harmony and truthfulness, should be the highest aim of Shakspearian culture.

—P. Blakiston, Son, & Co., medical and scientific publishers, booksellers and importers, 1012 Walnut Street, Philadelphia, have just ready "The Cerebral Palsies of Children," a clinical study from the Infirmary for Nervous Diseases, Philadelphia, by William Osler, M.D., F.R.C.P., London; physician-in-chief Johns Hopkins Hospital, Baltimore; late professor of clinical medicine, University of Pennsylvania.

—Messrs. Ginn & Co. of Boston have for some time been publishing a series of classics for children, with the object of introducing the young to a better class of literature than most of them now read. The different volumes of the series comprise stories of various kinds, biographical and historical works, and any others that seem suitable for young readers. The series has proved successful in a mercantile sense, and already comprises more than thirty volumes. The latest issue is entitled "The Two Great Retreats of History," and contains Grote's account of the retreat of the ten thousand Greeks, and an abridgment of Ségur's account of Napoleon's retreat from Moscow. Count Ségur was an officer in the French army and an eye-witness of the scenes he relates, and his story of the great disaster in Russia has long been celebrated. The two works together make an interesting volume, and can hardly fail to hold the attention of all young people that can appreciate historical events.

—The *Magazine of American History* opens its July number — the beginning of its twenty-second volume — with a "Story of the Washington Centennial," illustrated from photographs by amateurs and other artists, executed during the progress of the celebration. It is safe to say that no great public event was ever before seized in all its interesting particulars, and placed before the popular eye, with such felicitous results. The truthful pictures of the scenes are rendered doubly attractive and valuable through the portraits of the distinguished characters in our national life of to-day appearing in them. The view of the assemblage on the steps of the Sub-treasury Building in Wall Street is good, and every reader will be able to recognize in the picture the distinguished men present whose faces are best known. "The Discovery of the Mississippi" is the second paper, an instructive study by Henry Lee Reynolds. "Washington and William the Silent—a Parallel," is an article by M. M. Baldwin. Judge Dykman contributes the second part of his account of "The Last Twelve Days of Major André." Gen. Alfred E. Lee writes a paper, entitled "Some Glimpses of Holland," in which he gives us a general idea of the habits and customs of our Dutch ancestors, and a better knowledge of our Dutch cousins in their homes. There is a sketch of Hon. Robert C. Winthrop, by Daniel Godwin; and a short paper on Col. William S. Smith, the son-in-law of John Adams, by M. D. Raymond. There are other short articles, and the notes furnish fresh and curious data.

—Roberts Brothers published on the 25th, in two handsome octavo volumes, "Rogers and his Contemporaries," by P. W. Clayden, containing hitherto unpublished letters from Lord Byron, Wordsworth, Coleridge, Walter Scott, Everett, Daniel Webster, Prescott, Ticknor, Irving, and Sumner, all of which furnish abundant materials for forming a just estimate of Rogers's place in English literature and social life; "By Leafy Ways," by F. A. Knight, describing wild life in Old England in as interesting a manner as John Burroughs does that of New England, with fine illustrations by E. T. Compton; the second part (July to December) of E. E. Hale's "Sunday-School Stories;" and "Sunday-School Stories for Little Children," by Lucretia P. Hale and Mrs. Bernard Whitman.

—*Medical Classics* for June includes articles on "The Care of the Hands, Finger-Nails, and Nail-Brushes;" "The Doctor in the Kitchen;" "Fruit as a Food;" "Strawberries as Food and Medicine;" "Blond Hair;" "Wakefulness;" "Early Rising;" "Vaca-

tion Victims;" "The Gospel of Rest;" "The Legal Liability of Doctors;" "The Danger of Ignorant and Indiscreet Bathing;" "Bleaching the Hair;" "The Filtering of Drinking-Water;" "Liver-Spots;" "Typhoid-Fever on Long Island;" "Lotions for Freckles, for Red Hands, for keeping the Hands Soft and Smooth;" etc. There is also a very interesting article on "The Policeman as an Autocrat, and Clubbing and its Effects," by Capt. Gunner of the New York police.

— Mr. Gladstone has an article in the *Nineteenth Century* for July, entitled "Plain Speaking on the Irish Union." In it he says, "Sir Richard Webster, in examining William O'Brien before the Parnell Commission, implied that a grave charge would be proved against certain Irishmen if it could be shown that they regarded English power as alien. I should like to have asked Mr. O'Brien whether the Irish, so far as he knew, regarded the Act of Union as possessed of the same moral authority as the laws against theft and murder, or as possessed of moral authority at all. I do not doubt that Mr. O'Brien would have answered that they regarded it as an act of force to which Ireland was under, not a moral, but only

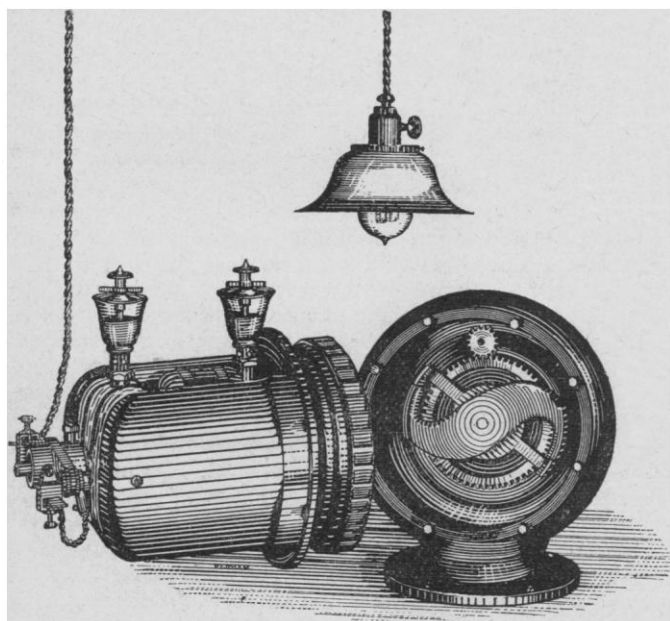
a prudential obligation to conform. There may be immorality in miscalculated resistance even to immoral laws, but such resistance is not in itself immoral. The question is, whether worship of the Act of Union is piety or superstition."

— Mr. George John Romanes, the distinguished author of "Mental Evolution in Man: Origin of Human Faculty," will contribute to *The Open Court* of July 11 (Chicago) an article entitled "The Psychic Life of Micro-Organisms." The public will recall M. Binet's able series of essays in Vol. II. of *The Open Court*, in which the soul-life of these tiny and interesting beings was so carefully discussed. The essays were afterwards published in book form by The Open Court Publishing Company. In a preface written especially for the American edition, M. Binet took issue with Mr. Romanes relative to the stage in animal development at which psychological powers first appear. The criticism has attracted much attention. The eminent English scientist, in turn, now replies to the strictures of the French *savant*. The controversy will be of interest to all. To those who have read M. Binet's monograph the reply of Mr. Romanes will be an appropriate supplement.

INDUSTRIAL NOTES.

A Combined Water-Motor and Dynamo.

A COMPACT combination of a water-motor with an electric generator, now being placed on the market by the Belknap Water Motor Company of Portland, Me., is shown in the accompanying illustration. It is intended for small plants of from ten to fifty or more 16-candle-power lamps. In the engraving the dynamo and



COMBINED WATER-MOTOR AND DYNAMO.

water-wheel are shown detached from the wheel-case and stand or base. The gear-wheel and pinion seen in the wheel-case operate the devices which control the flow of water to the wheel, thus governing the speed of the motor and dynamo. Water under the requisite pressure is admitted at the centre of the case, in the rear, passes through the curved arms shown in the case, whence it impinges upon the curved buckets of the wheel, at the inside, and escapes at the exterior of the wheel, passing away through the base of the motor casing. The wheel is an outward-flow turbine or vortex wheel, mounted on the same shaft as the armature, and may be run at a speed ranging from one thousand to three thousand revolutions a minute, according to the head of water available. Several of these novel electric-light plants are now in operation, and are said to give great satisfaction.

Aside from its use in connection with a dynamo, this motor, the "Little Giant," as it is called, is used for a variety of purposes, having been on the market some eight or ten years. In many towns and cities of the United States and Canada, where water at

a pressure of twenty-five or thirty pounds may be had at a reasonable price, these motors, ranging in size from seven to twelve inches in diameter, are successfully running printing-presses, lathes, saws, jewellers' and dental tools, organs, sewing-machines, and coffee, spice, and drug mills.

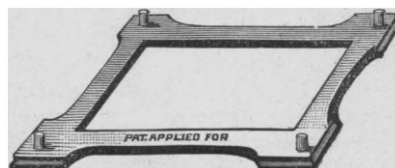
Graduated Glassware and Bohemian Beakers.

James W. Queen & Co., Philadelphia, have recently made arrangements for the manufacture of chemical glassware of fine quality, and call particular attention to the accuracy of their graduated ware, such as burettes, pipettes, volumetric flasks, cylinders, etc. These goods are made abroad, by experienced workmen, of the best German glass.

In order to satisfy themselves still further, as well as their customers, as to the quality of the apparatus, they selected at random a number of each of the articles mentioned above, and sent them to William H. Greene, professor of chemistry in the Philadelphia Central High School, asking him to submit them to a comparison with his "standard instruments," made by Geissler of Bonn. The results of these tests, as shown in a letter from Professor Greene, are highly satisfactory.

A Rubber Mat for Type-Writers.

A useful device, manufactured by the United Rubber Company of Trenton, N.J., is shown in the accompanying illustration. It is a rubber mat, to be placed under a type-writing machine for dead-



ening the clicking noise of the type, which, even in the best of type-writers, sometimes becomes annoying. The mat reduces the noise to a minimum, and is made in various sizes and styles to fit machines of different makes.

Notes on Electric Railways using Thomson-Houston System.

The popularity of electric railways is evidenced by the recent purchase of the Des Moines Broad Gauge Railway, equipped with the Thomson-Houston system, by a wealthy Chicago syndicate; the purchasing price being \$350,000, some three times the original cost of the road. When equipped with horses, this road did not pay operating expenses; but, since its equipment and operation under the Thomson-Houston system, its net earnings will pay 3 per cent dividends upon an investment of nearly \$400,000. The road has never had a repair-shop for its electrical apparatus; and in a recent conversation its president said that they did not know what electrical repairs meant, as they had had none to make. In some respects the Des Moines road has been the most wonderful

in results of any electrically equipped road; it having at its power-station but one 30-horse-power generator, which operates eight cars over grades running as high as 10 per cent without indications of overheating, and frequently tow-cars are used with those equipped with motors. On one branch of the system the necessity of speedy equipment compelled the use of a No. 2 copper wire without feeders, such wire being the only available material; yet, with this small conductor, the cars are run at a rate of six miles per hour up a 10-per-cent grade, three miles distant from the station.

The Omaha and Council Bluffs Railway and Bridge Company are progressing rapidly with the electrical equipment of the recently purchased horse-car lines in Council Bluffs. For the operation of such lines they have purchased ten additional motor-trucks and two generators from the Thomson-Houston Electric Company. In placing this order for additional apparatus, the management of the road state, in a letter to the Thomson-Houston Company, that

they consider their present line equipped with the Thomson-Houston system the most perfect electric railway in the world.

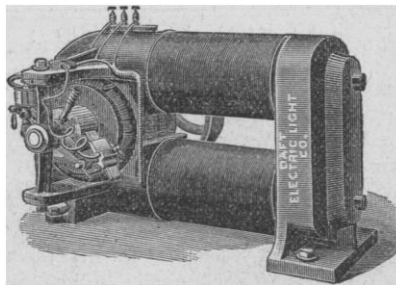
The Omaha Motor Railway Company is nearly ready to begin operations with the Thomson-Houston electric system. The largest power-station which has yet been constructed for electric-railway operation is owned by this company, and the car-equipment ranks second in quantity among electric railways yet constructed, it having twenty-six motor-cars, each of which will be used to tow at least one additional car, and many of the motor-cars will tow two additional cars. The success of the Thomson-Houston system on the Omaha and Council Bluffs line has made the citizens of Omaha jubilant at the immediate prospect of such rapid transit being given them over their entire city. In addition to the equipment ready to be put in, the company intends to add twenty additional motor-cars upon the extensions to its system within a few months.

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The Committee has recently returned and has made a very interesting Report upon the general development of Kansas and Nebraska as well as the business of the Company. The Company will be glad to send this Report to any address.

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